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AMERICAN ASSOCIATION OF PORT AUTHORITIES

Fifteenth Annual Convention

Norfolk, Virginia

October 18, 19, 20 and 21, 1926

**Report of the Committee on Technical
Port Language**

SUPPLEMENT TO THE PORT GLOSSARY OF 1925

**Containing Several Hundred Additional
Suggested Definitions**

Compiled by

Major R. S. MacELWEE, Ph. D.

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OFFICE OF THE SECRETARY

Room 200, New Orleans Court Building

New Orleans

REPORT OF THE COMMITTEE ON TECHNICAL PORT LANGUAGE

The Committee on Technical Port Language presented a glossary to the convention, which met on September 28th, 1925, at New York.

In view of the fact that the glossary had not been previously submitted to the membership for consideration, it was decided not to adopt it, but the same committee was instructed to carry on the work during the coming year with a view of submitting the glossary to the membership probably a month in advance of the convention in order that such points as might be deemed worthy of consideration might be brought up by the membership and definite action taken at the time of the convention.

It was the thought of the Association that during this year the membership would make suggestions which would be acted upon by the committee and then be submitted to the coming convention.

A few of these suggestions have been received, and in addition, a considerable enlargement of the glossary has been made, chiefly through the efforts of Dr. R. S. MacElwee, who has given considerable time and thought to it.

As a result, there is being submitted to the membership, in advance of the Norfolk convention, an enlarged glossary, it being expected that suggestions will be ready at the time of the convention in order that the work may either be rejected or accepted.

In passing, it should be stated that it is in nowise the thought of the committee that the glossary is complete or perfect, and that, irrespective of whether or not this glossary is adopted by the Association, nevertheless a standing committee should be maintained for the purpose of making amendments and additions to it from year to year as port practices, customs, and terms change.

Respectfully submitted,

B. C. ALLIN, Chairman,

R. S. MacELWEE

FRANK G. WHITE.

Houston, Texas,
August 24, 1926.

Committee on Technical Language.

KEY TO SOURCE REFERENCES

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SUPPLEMENTAL DEFINITIONS

Compiled by

Major R. S. MacELWEE, Ph. D.

(Subject to typographic and other corrections)

For original list of terms, see report of 1925.

A

ADVANCE—The distance a vessel continues to travel on a course before responding to the change of helm. (R. S. M.)

The distance the center of gravity of the ship has advanced in a direction parallel to her original course, measured from the point where the helm was put over. (Shank.)

AERIAL CABLE WAY—An aerial conveyor installation consisting of a single or double track cable stretched between two towers, a carriage travelling on the track cable with hoisting ropes and drum, usually operated from one of the towers. If used for lifting and transporting material, it is called a **hoisting transporting cableway**. Towers may be fixed, rocking or traveling. One tower may travel in an arc with the other tower fixed, called a radial cableway. (R. W.)

AGGREGATE—See concrete.

AGIO—The difference between the real and nominal value of money. When paper currency is depreciated, the agio represents the premium at which gold stands as compared with the paper. (J. Steph.)

ANCHOR—An instrument attached to the ship by a chain or cable which will, when cast overboard lay hold of the earth by a fluke or hook and hold the vessel in place. (B. C. A.)

ANCHOR (To drag A)—When the purchase of the anchor on the bottom (holding ground) is less than the force of wind and tide against the ship, the anchor is dragged over the bottom by the ship. (R. S. M.)

ANCHORS, STEARN—To avoid the turning, by the tide, in narrow waterways the larger types of liners are being equipped with stern anchors and cable. Special signals that a ship is so anchored have been authorized for the Port of London. (Shank.)

ANCHOR, (to slip the Anchor)—To cut off the anchor chain or cable at the ship end and leave the gear, anchor and chain, on the bottom. This is done (1) when weather conditions will not permit weighing anchor in the usual manner or (2) when necessary to get under way immediately as when fired upon or to seek seaway when caught by a storm in an exposed roadstead. (R. S. M.)

ANCHOR, (to weigh A)—To hoist the anchor aboard preparatory to getting under way. (R. S. M.)

ANCHORAGE, DUES—Fee paid the harbor master for the privilege of anchoring in specified anchorage grounds of a harbor. (R. S. M.)

ANCHORAGES—For compass adjustment facilities provided in harbors for the swinging of ships to verify or adjust magnetic compasses. In localities where a sufficient period of slack tide exists the swinging may be effected with the assistance of a tug when the ship is moored head only to the buoy. (Shank.)

ARBITRAGE—Dealing in the momentary difference of price of exchange or commodities in different parts of the world i. e. different markets. (R. S. M.)

ARBITRAGE—The operation of buying securities or produce in one market and telegraphing orders to agents to sell them in another market, whereby a profit is made on a difference in price due to the constant fluctuations in prices on the various Stock and Produce Exchanges of the world. (J. Steph.)

AVERAGE BOND—The document signed by contractors to a general average adjustment, under which they receive delivery of cargo on undertaking to pay their share of the general average contribution as soon as the amount is ascertained.. (J. Steph.)

B

BAFFLE PLATE—A plate suspended in front of the discharge pipe of a steam jet or material jet produced by air pressure or suction or gravity, or fixed on the wall of the point opposite for receiving the impact of material. (R. W.)

Vessels moored to a wharf or in close quarters lower a baffle plate over water pipe discharges to prevent sullyng wharf or nearby ship. (R. S. M.)

BANKIA—Marine borer of the Molusca (clam shell) family. See **Teredo**. (R. S. M.)

BARGE—A floating craft of full body and heavy construction designed for the carrying of cargo but without means of self-propulsion. (R. W.)

BATCH CAR—A car used in glass plants or similar places for receiving, proportioning or mixing and transporting a batch to a furnace. (R. W.)

BATCH BOX—Box used for the holding of materials for making a batch of concrete or for holding and conveying a batch of concrete after mixing. It is usually made of steel or supported with Steel. Some are made with trunnions on a car, discharged by turning over and dumping. (R. W.)

BEACHING—Running a leaking vessel ashore to prevent sinking in the offing or the fair way. It is advantageous to include in the sailing directions of a port references to sloping foreshores free from rocky ledges which will enable a vessel holed in a collision to beach under her own power or with the aid of tugs. (R. S. M.)

BEAM—(Nautical)—(1) Ship. The greatest width of a vessel.
(2) (in construction) A horizontal member in a structure, supported at each end, designed to carry a load.
(3) The straight part or shank of an anchor.
(4) A ray or collection of parallel rays of light emitted from a luminous body. (B. C. A.)

BEARING—The compass reading in points or degrees of the location of the vessel with respect to some other object. (R. S. M.)

BEARING, ANGULAR BALL BEARING—Ball bearing which will carry a load of axial and radial loads on a shaft. Two such bearings are required to carry a shaft on definite loads for any direction. (R. W.)

BEARING, BALL THRUST BEARING—A ball bearing arranged to carry an axial load on a shaft. (R. W.)

BEARING, RADIAL BALL BEARING—A ball bearing for supporting a shaft which is subject to transverse loads. (R. W.)

BELAY—To wind or make turns with a running rope around a pin (called a belaying pin) or cleat in order to hold secure or make fast, or to stop by so doing. Often used in the imperative as, "belay that" meaning, stop that, quit, that's enough.

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BELAYING PIN—A strong iron rod near the foot of the mast, or elsewhere, securely fastened around which a rope may be turned to make it fast. (Webster.)

BENCH MARK—The permanent indication of the harbor datum plane from which water levels are calculated, as. . . + or — . . . datum plane. (R. S. M.)

BENDING MOMENT—The total bending tendency to which a beam is subject, expressed generally in inch-pounds. A bending moment of a transverse section of a beam is equal to the algebraic sum of the products of each of the forces acting to produce bending multiplied by the perpendicular distance of the line of action of the force from the section. (R. W.)

BENDS, THE—Distress caused by breathing of Co₂ and air bubbles in the blood from working in caissons or diving suit under heavy atmospheric pressure. To avoid the bends caisson workers are locked through an air chamber where the air pressure is reduced gradually or by bringing the diver to the surface slowly—See “Blowing up” (R. S. M.)

BERTH—On the /B.
A chartered vessel offering to receive cargo as a common carrier. (R. S. M.)

BERTHING DUES—Or Quay Dues is Dockage. The charge against the vessel for the permission to moor to a wharf, quay or pier and occupy a berth in the dock at the quay. (R. S. M.)

BILL OF LADING—(Ocean or Port B/L.)—Issued by a steamship company as a contract for carriage by sea and a receipt for merchandise. The Bill is endorsed in blank and a full set or all the signed copies, (3 or 4 copies the number being specified on the bill) becomes a negotiable instrument as giving title of the holder to merchandise. (R. S. M.)

BILL OF LADING—(Through B/L.)—Is an order Bill of Lading and ocean Bill of Lading combined. A contract of carriage by rail and ocean carrier and subject to similar negotiable features, as a port or ocean B/L. (R. S. M.)

BIN—An enclosure for the storage for material in bulk. (R. W.)

BITE—The friction of the fall on the drum of the winch, which gives control of the fall. (Br.)

BITT—Cast iron cleat or part on a wharf for making fast mooring lines. (R. S. M.)

BLOCK—A metal or wooden frame or shell containing one or more pulleys or sheaves, generally set side by side and turning freely on the same axis, used with a rope as a means of hoisting heavy weights. (R. W.)

BLOCK CARRIAGE—The type of trolley used for light loads having two sheaves in line in the direction of motion of the trolley. (R. W.)

BLOCK, CHOCK-A-BLOCK—The name given to the condition of a tackle when the two blocks have been driven together and no more hoisting can be done with them. (R. W.)

BLOCK, GIN—A single block having a sheave of large diameter used where a hoisting operation has to be repeated many times, as in loading or unloading cargo. (R. W.)

BLOCK, SNATCH—A single block generally used as a guide block and having one side of the frame arranged with a hinge and lock so that it may be opened to allow the bite of a rope to be placed on the sheaves without the necessity of receiving the rope end through the block. (R. W.)

BLOCK, STRAP—Blocks having as a shell or casing, two arm straps connected by distance pieces and bolts with holes for the sheave pin. (R. W.)

- BLOCK (Coefficient)**—The relationship of the cubical contents of the hull of a vessel to the content of a parallel pipedon having the maximum dimensions of length, depth and beam of the hull. The relationship is expressed as a decimal. The block coefficient of a cargo vessel is about 0.8, of a destroyer .4, of a fast passenger liner .55 or .6 etc. (R. S. M.)
- BLOCKS (Keel B)**—The wooden blocks upon which a vessel settles when the water is withdrawn from a dry dock. (R. S. M.)
- BLOWING UP**—Term applied when a deep sea diver working under heavy pressure comes to the surface too quickly. The bends can be avoided by sending him down again at once, when possible, or placing him in a recompression chamber. (Shank-R. S. M.)
- BOARDING INSPECTORS**—Collector for the district in which any vessel arrives from a foreign port may put on board such a vessel while within such district or going from one district to another, one inspector or other customs official. (U. S. S. B.)
- BOATMAN CHARGE (Running Lines)**—A charge against the ship for the services of making fast the mooring ropes. Usually \$5 to \$10. A light rope is thrown to the boatman who row to the pier or quay and haul the rope with mooring line attached onto the pier and place it over a bollard. (R. S. M.)
- BOAT SERVICE HIRE (Fee)**—A charge for bringing persons ashore or off to the ship. The master must come ashore to report to various officials and if his ship is in stream he can lower his own boat or, as is more usual, hire a speed boat, usually present in numbers in any important port. (R. S. M.)
- BOLLARD (Twin Type)**—Cast in pairs.
 ——— Vertical Type, with both members upright.
 ——— Racked Type, for towing and mooring, with each bollard inclined away from a perpendicular centre line. (R. S. M.)
- BONDED STORES**—See Warehouse.
- BOOM**—A long pole or spar used to extend the sail of a ship at its base. (Br.)
- BOOM**—Principal moving part of a kind of crane. It is a long span or strut of wood or steel, riveted or hinged at one end at a point fixed at one height on the frame, mast or vertical post and with its other end supported by ropes. The load is carried by ropes passing over sheaves at the boom point. (R. W.)
- BOOM, LATTICED**—A boom made of rolled structural shapes laced together with diagonal steel straps. (R. W.)
- BOOM, LUFFING**—A boom which can have its inclination changed, the outer end or point being raised or lowered. (R. W.)
- BOOM SEAT**—A metal fitting or socket at the foot of the derrick mast which receives the seat of the boom and permits the boom to be changed. (R. W.)
- BOOT FOR SHOE**—End for end; to reverse. When one end of a fall is worn the other is put in its place—boot for shoed—to take the hard wear. (Br.)
- BORROW PIT**—The bank from which gravel, sand, etc., is hauled to make a fill. (R. S. M.)
- BOTTOMRY BOND**—The undertaking given by the captain of a ship which requires immediate repairs, and the necessary money for which is the consideration for the Bond. The payment under the Bond is enforceable only if the ship reaches port safely and when the consideration has consequently been of benefit. (J. Steph.)
- BRACE**—A structural member placed diagonally between or near the junction of two other members to stiffen their connection. (R. W.)
- BREAK OUT**—To lift cargo from its place. (Br.)

- BREAKER OUT**—A man who first lifts out the pieces of cargo or bunches (of bananas) from stowed position in the hold. (Br.)
- BREASTING OFF**—Mooring a vessel some distance from the wharf or quay, 15' to 20' by means of hauling the vessel against long, heavy timbers or braces (breasting off spars) to permit lighters, bunkering equipment, floating cranes, etc., to work between the ship and the quay. (R. S. M.)
- BREASTING OFF SPAR**—A spar used in breasting off. (Br.)
- BRICK TEA**—The name given to tea which is compressed into blocks or slabs. There is a large trade in this tea between China and Russia, but the article does not enter British Commerce. (J. Steph.)
- BRIDGE, DRAW**—General term for all bridges that can be moved to open a channel and permit the passage of vessels. (R. S. M.)
- BRIDGE, DRAW, SWING**—All movable types, revolving, horizontally.
- (1) Single draw with pivot at the bulkhead, close to the edge of the coping. The axes of rotation being half the width of the bridge from the coping to bring the open bridge entirely within the bulkhead line.
 - (2) Double draw with two spans of equal length with the pivot supported on a structure in the middle of the channel, splitting the channel into two parts each spanned by half the bridge, when closed. (R. S. M.)
- BRIDGE, FLOATING OR PONTOON**—The bridge is waterborne, continuously or wholly and when being moved or opened, carried on pontoons. Usual use in military operations. Examples of permanent use are Cologne, and Kaiser Wilhelm Canal at Hottennau. (R. S. M.)
- BRIDGE, TRAVERSING**—Supported by the quay or bulkhead at or about the coping level and slid forward or withdrawn in a straight line. (Br. Cun.)
- BROWNIES**—Men who sweep off the piers. (Br.)
- BUCKET**—A container for temporarily holding quantities of material in bulk while being conveyed from one point to another. (R. W.)
- BUCKET, CENTER-DUMP**—A bottom dumping bucket which has two doors meeting along the middle of the bottom, which when released, move outward and downward. (R. W.)
- BUCKET BACK PLATE**—Steel plate forming the back of a shell of a clam-shell grab bucket. (R. W.)
- BUCKET, BOTTOM-DUMP**—A bucket which is emptied by opening the bottom and allowing the load to drop out. (R. W.)
- BUCKET BOTTOM PLATE**—A steel plate forming the bottom of a shell of a clam-shell grab bucket. (R. W.)
- BUCKET, CLAM-SHELL**—A grab bucket in which the bowl is formed by two parts like the shell of a clam. It is distinguished from the orange-peel in which three or four segments come together at a point to make a truly spherical bowl. (R. W.)
- BUCKET, CLEAN-UP**—A grab bucket usually the clam-shell type which is especially designed to recover all the material from the space in which it is working. (R. W.)
- BUCKET, CONTROLLABLE-DISCHARGE**—Bucket which can be discharged gradually under the full control of the operator. Two-rope grab buckets have a controllable discharge also two-line bottom dumping buckets. (R. W.)
- BUCKET, CORNER BAR**—In clam-shell grab buckets one of the links which are pivoted at the lower end to points near the rear corners of the shells and at the top to the top bucket head. These links guide the rear portions of the bucket shells during closing and opening. (R. W.)

- BUCKET CUTTING EDGES**—The edges of the shells or spades of a grab-bucket which do the cutting into or scraping of the material. (R. W.)
- BUCKET, FOUR-ROPE**—A grab bucket which is carried by two holding-lines and two hoisting-and-closing lines. In one arrangement the holding lines are dead-ended on an equalizer bar at the head of the bucket and the closing lines are similarly fastened on the closing arms. (R. W.)
- BUCKET, HAND DUMPING**—Bucket which is turned over entirely by hand or which has its dumping latch released by hand. (R. W.)
- BUCKET, ORANGE-PEEL**—A grab bucket of which the bowl is nearly spherical in shape and is formed of three or four segments which come together in a point at the bottom. These segments are termed blades, spades or bowls. (R. W.)
- BUCKET, POWER-ARM**—Clam-shell bucket in which the closing powers are obtained by rope tackle which is rigidly attached to one shell of the bowl, the other shell being forced to move simultaneously by means of the connecting linkage. (R. W.)
- BUOYS, CAN**—Showing a flat top above the water—on the port side in British Harbours. (Shank.)
- BUOYS, CONICAL**—Showing a pointed top of a cone above water. In British ports they are the Starboard or Right Hand buoys, upon entering. (Shank.)
- BUOY, DUES**—Port Charges assessed against the ship for the purpose of maintaining the channel buoys (not U. S. practice in public harbors nor channels) as these are maintained by the Federal Government from the national treasury.) (R. S. M.)
- BUOY, HIRE**—Fee paid by the ship for the use of a mooring buoy—(Similar to dockage in this sense.) (R. S. M.)
- BOUYS, PILLAR**—Having a tall central structure on a broad base, like bell, gas, automatic sounding, etc., they are placed to mark special positions. (Shank.)
- BUOY, SEA**—The buoy marking the entrance to a channel from the open sea. (B. C. A.)
In U. S. waters conical buoys bearing serial numbers in white figures, "red-right return" i. e. entering port, black to port. (left) red to starboard (right).
In British waters no uniform system but conical buoy right, can (cylindrical) buoy left is general. The International Hydrographic Office at Monaco is endeavoring to bring about common international usage in buoying harbors. (R. S. M.)
- BUOYAGE**—(1) The offered facility of buoy moorings
(2) The fee paid for the use of such moorings.
- BUOYS, SPAR**—Long thin masts showing above the water are anchored to indicate the direction and force of the current. (Shank R. S. M.)
- BUOYS, SPHERICAL**—Showing a domed top above the water. In British harbours they mark the ends of middle ground. (Shank.)

C

- CABLE**—A general term applied to a rope or a chain and used more or less interchangeable with rope. (R. W.)
- CABLE, TRAMWAY**—Is an aerial cable way without hoisting mechanism. Aerial cableways may be used for dredging, grab buckets, gravity transporting, hoisting and transporting. (R. W.)
- CAMBIST**—A term applied to one who exchanges foreign money or deals in foreign notes or Bills of Exchange. (J. Steph.)

CAMEL—A lifting pontoon used in salvage. The origin of the floating dry dock was the use of an old hull of a vessel called "The Camel" the stern being cut off the disabled vessel was floated onto it, and when "the camel" was closed and pumped out the vessel was floated. Floating dry docks and lifting pontoons in England have been called camels, for more than a century. (R. S. M.)

CAPSTAN—"An upright drum or cylinder revolving upon a spindle, and worked by bars or levers." (Br.)
Capstans in modern practice are more frequently operated by steam or electricity. (R. S. M.)

A stationary vertical shaft concave drum machine for winding rope or chain and used for hoisting or hauling purposes. (R. W.)

CAPSTAN, WINDLASS—A combination of a capstan and a windless used on ship board. (R. W.)

CAR—A vehicle used on tracks such as railroads, guide rails in elevators, etc. (R. S. M.)

CARGO, DOOR—(Or cargo opening) a door fitted to the side or upper bulkhead of a vessel for the purpose of providing a passage through which cargo may be trucked. (R. W.)

CARGO, PORT—An opening on the side of a vessel for loading and unloading cargo. (R. W.)

CARROUSEL—A form of open conveyor which travels entirely on a horizontal plane making turns at the end about a vertical axis and usually returning parallel to itself. (R. W.)

CASE HOOK—Truckman's hook, also called loader's hook. (Br.)

CAUTCHOUC—An important elastic gum, commonly known as india-rubber. It is the sap which is obtained by the tapping of a species of tree grown in the tropics. After the drying process, the sap or juice thickens, and when carefully prepared is white in colour, but it is usually brown or brownish-black. It is lighter than water. The principal supplies come from Brazil, and the Straits Settlement and Dutch East Indies. (J. Steph.)

CAVITATION—In pumping water, the term is applied to separating or "running away" of the impeller blades from the flowing water, and is caused by the pressure at the zone of cavitation being so low that the equivalent pressure on the water exerted by the atmosphere does not produce the requisite velocity of the water to permit it to follow the propeller blades. (Shank.)

CEILING—The tight wooden planking that lines a ships hold.
The close fitting interior wooden lining of a summer cottage.
The maximum flying height of any aircraft—the height to which it can rise above the ground. (R. S. M.)

CESSSES—Horizontal stiffening members of a dock gate leaf. (R. S. M. Br. Cun.)

CHANNELS, CONFINED—A channel cross section area about 200 times that of the vessel is required at all normal speeds, if the resistance is not to be affected by the boundaries. (Shank.)

CHARTER—To hire or "rent" a vessel. (R. S. M.)

Charter Party, a contract by which a vessel is turned over to the use of another. There are many forms such as: Baltic Time form, produce exchange form, Welsh coal form, U. S. S. B. forms, etc. (R. S. M.)

Bare Boat Form, is akin to the lease, for a given period, of an unfurnished house, the tenant paying all expenses and defraying the cost of insurance and repairs. (Annin.)

The charter pays all voyage and cargo expenses, marine and war risks, engages officers and crew and pays and subsists them. (Annin.)

Baltic Time Form—The Baltic and White Sea Conference uniform time charter 1912. This is the standard time charter form. Bases—ship's deadweight ton capacity, per month. (Annin.)

The Time Charter—"The charterer hires the ship, manned, provisioned, and supplied with deck and engine room stores (but not fuel) for a given period of time, at a stated compensation per unit of time, for a stated period of time." Similar to renting a furnished house. (Annin.)

The Net Form Charter—A modified time charter "the operating expenses go to the owner, the voyage and cargo expenses to the charter. (Annin.)

The Gross Form Charter—"Similar to an American Plan Hotel Here the owner pays all regular expenses incident to the voyage from the time the ship is berthed until the cargo is discharged, operating expenses, subsistence, stores, deck and engine supplies, fuel, port charges, towage, pilotage, wharfage, stevedoring and all other regular voyage expenses—overtime, heavy lifts, etc., are extras, and are paid by the charterer. (Annin.)

CHARTER PARTY—Is the written agreement or lease between owner and leaser or rentor of a vessel. (R. S. M.)

CHEEK BLOCK—One of the pair of heavy weights shaped so as to fit on the cheeks of the fall block of hoisting tackle making it heavy enough to cause the tackle to overhaul without load. (R. W.)

CHELURA INSULAE CALMAN, (A crustacea borer) from Christmas Island 1910. Differs from *Chelura Terebrans* by longer antennae and larger anterior claws, short spine. Damage secondary to that of *limnoria*. (A. & J.)

CHELURA TEREBRANS PHILIPPI, slightly larger than the *Limnoria* and heavily feathered with long hairs. It works with the *Limnoria* making slightly larger galleries. (A. & J.)

CHOCK—To brace; e. g., to chock the cargo in with dunnage. (Br.)

CLEARANCE FEES—Charges.

CLUB HAULING—A steamer at anchor—a method of ensuring a swing in the desired direction at tide turn. A heavy wire is led from the quarter which will apply the purchase in the required direction and the strain gradually increased as the tide eases in velocity, the chain cable being veered slightly at the same time. The bight of cable is thus brought abaft the bows to produce a pivoting action, the wire is then walked back to allow the chain cable take its natural trend. (Shank.)

COFFERDAM—A temporary contrivance for the exclusion of water form a site during construction work. A cofferdam consists essentially of two timber faces enclosing a facing. Name frequently applied to Skin dams or Cofferdam and Sheet piling dams used for the same construction purposes but consist of a single row of sheet piling, or whole or half timber, retained by tiers of horizontal wallings (Br. Cun.)

COLLECTOR—Of the Port is the Collector of Customs; includes a deputy collector of customs and any person authorized by law or by regulations of the Secretary of the Treasury to perform the duties of collector of customs. (U. S. S. B.)

COLTANCIN'S SYSTEM—Of reinforced concrete slabs differs from the disconnected bars of the Monier and Hennebique Systems are replaced by a jointless wire net work. The claim is greater strength with less metal. (Br. Cun. R. S. M.)

COLUMN—A vertical structural member designed for the resisting of vertical or axial compressing load. (R. W.)

COMPASS ADJUSTMENT—See Anchorage for Compass Adjustment.

CONCRETE—An admixture of various mineral substances which become incorporated into a solid body under chemical action. It consists of two parts—**aggregate** and **matrix**.

The **aggregate** is a mass of one or more of the following: slag, shingle, burnt clay, broken stone or brick, gravel, sand.

The **matrix** consists of cement (or hydraulic lime) combined with water (Br. Cun.)

CONSERVANCY—The construction and maintenance of harbor channels. (R. S. M.)

CONSULAR BILLS OF HEALTH—Any vessel (a) at any foreign port clearing or departing for any port or place in the United States or its possessions or other dependencies, must present a bill of health from that port. Such a bill shall set forth (a) the sanitary history and condition of said vessel, and (b) that it has in all respects complied with the rules and regulations in such cases prescribed for securing the best sanitary condition of the said vessel, its cargo, passengers, and crew. (U. S. S. B.)

CONSULAR FEES—Charges for stamps affixed to visas or for certifications of documents as required by law in the countries involved in a voyage.

Fee for the certification of the ships manifest by the consul of the country of destination. (R. S. M.)

CONTANGO—The consideration paid by a "Bull" operator on the Stock Exchange when he "carries over", and consequently postpones payment of his purchases. It is interest on the money required to keep control of the stock which is the subject of the "Bull" speculation. (J. Steph.)

CONVERGENCY—(In wireless direction finding a ship's position) allowances for the varying meridional expansion or contraction as the bearing line crosses toward the equator or pole is termed convergency. The earth being an oblate spheroid any part thereof is relatively rotund the meridians converging to a radiating point at each pole. (Shank.)

CONVEYOR BELT—Conveyor consisting of wide belt or rope passing around a high pulley at one end and a tail pulley at the other, (both pulleys having horizontal shafts), supported by numerous other pulleys between them placed under both runs and carrying bulk or package material on the upper run. (R. W.)

CONVEYOR BELT TRIPPER—The device for causing the load on a conveyor belt carrying bulk material to be discharged at some other point than over the head pulley. It consists of a rigid frame spanning the belt and carrying two large pulleys on horizontal shafts so placed that the belt makes an S-shape turn in passing them. (R. W.)

CONVEYOR, CROSS-LINE—Conveyor line which is at right angles to the conveyor or prevailing system. (R. W.)

CORE—The spoil from a test boring from which the nature of the underlying ground may be ascertained by inspection. (R. S. M.) (Foundry) the baked sand in the mold that makes the casting hollow—such as in the case of a radiator section. The heat of the metal causes the core sand to disintegrate and it can be shaken out. (R. S. M.)

CORNER—Longshoremen call the far side of the street opposite the pier, where they hang around to await the hiring, the "corner." (Br.)

COUNTERVAILING DUTY—A customs tax imposed on imports so as to place them on an equality with the home products that are liable to excise tax. (J. Steph.)

COUNTERWEIGHT—A heavy weight so placed and connected in a machine as to counterbalance a load or moving part. (R. W.)

CRAB—A term rather indiscriminately applied to several types of small hand-winches, to some winches operated by power, and also occasionally (British) to crane trolley. (See Winch and Trolley, which are preferable terms.) (R. W.)

Catching on oar (sweep) in the water when feathering on the back stroke is called **catching a crab**.

CRADLE—(Marine Railway or Shipway) the moving platform with keel blocks, moving on inclined tracks on which a ship is hauled out of the water. (R. S. M.)

CRANE—A machine for moving heavy objects by raising them, moving them horizontally, and lowering them in the new location. Two mechanisms are essential: the hoist for the vertical motion; and the mechanism of translation for the horizontal motion. (R. W.)

CRANE, BOAT—A type of rotary pillar for handling heavy lifeboats, launches, etc., on shipboard, principally on warships. One curved piece, usually of box-girder construction, which replaces both pillar and boom, is pivoted at the base, and carries the lifting tackle at its upper end. For heavy loads, the slewing is done by power: for smaller loads, it is done by hand, and in this case the frame is made of a single curved piece of steel, called a davit. (R. W.)

CRANE, BRACED JIB—A jib crane built up of structural steel shapes, diagonal braces and ties, gussets, clips, etc., riveted together as distinguished from one which is built like a curved plate girder, or is formed of a single curved piece like a ship's davit. Two general types of bracing are top or tie rod bracing; and bottom or under bracing. The simplest top braced or tie rod construction exists where the mast and jib are two straight structural shapes connected at right angles, and a diagonal tie attached at or near the outer end of the jib connects it to the top of the mast. Several such diagonal ties may support as many points of the jib. (R. W.)

CRANE, BRIDGE—A crane having a bridge along which a trolley may travel carrying a hoist and a load. The bridge may or may not be capable of travel. In this sense the term is used merely to distinguish a gantry or overhead traveling crane from a swing, jib or wall crane, or derrick. Sometimes called a girder crane. (See also Gantry, Cantilever Bridge.) (R. W.)

CRANE, BRIDGE STORAGE—A term sometimes applied to a gantry crane (with or without cantilever ends) especially arranged for the unloading of material in bulk, such as ore, coal, sand, gravel, etc., from cars or vessels, and placing it in open storage piles; also for reclaiming such material from the piles and loading it on cars or vessels. (See also Gantry, Cantilever Bridge.) The material is usually handled by a grab bucket. The hoisting winch is fixed in one of the towers, and the trolley is moved and the bucket hoisted by wire ropes. Or it may be of the man-trolley type, where the operator rides in a cab travelling with the hoist, all electrically driven. (R. W.)

CRANE, BUCKET—A term often applies to any type of crane which is capable of handling a grab bucket and is equipped with one. Any crane, provided it is sufficiently powerful, can handle a single line grab bucket, though the addition of a bucket may be necessary. A two-line bucket requires two hoisting drums which are partially or completely independent.

For continuous and rapid action, durable machinery of proper

strength and high speed must be supplied, but any type of crane may be adapted to the work. Overhead and gantry travelling cranes, derrick and locomotive cranes are, perhaps used most frequently. (See Trolley, Bucket.) (R. W.)

CRANE, CARGO—A crane especially adapted to the transferring of cargo between a vessel's hold and a wharf or lighter. If located on a pier or wharf, it is generally termed a wharf crane; if located on the vessel, it is often a derrick, and is one of the principal parts of the cargo handling gear. (See Cargo Handling Gear; Derrick, Ship.) (R. W.)

CRANE, CHARGING—An overhead travelling crane especially developed for steel works use in charging open hearth furnaces. A rigid structure hanging below the bridge has a horizontal arm which is capable of being lowered until the end is connected with the charging box, of raising it, passing it endways through the charging door, and rotating it about a horizontal axis, dumping the load of scrap. The motions are then reversed. (R. W.)

CRANE, COUNTERWEIGHT CARGO—A type of cantilever gantry crane used for cargo handling, in which, by a special reeving of the hoisting rope, the weight of the hook, fall rope, down-haul ball, block, skip, or slings, together with half the average load, are balanced by a counterweight. The load hook must then be lowered by power against the pull of the counterweight, but the size of the motor or engine and machinery to operate the hoist may be greatly reduced, as less power is required. (R. W.)

CRANE END TRUCK—One of the two end frames or carriage of an overhead travelling crane structure having wheels rolling on the rails of the runway, and supporting the ends of the bridge girders. In small cranes the trucks may be of cast or forged steel; in larger sizes they are of structural steel, cast steel or combinations of the two. They are rigidly secured at right angles to the crane girders, and are braced with horizontal gusset plates to prevent the structure getting out of square. Fitted bolts and reamed holes are generally used for these fastenings, as they must be made in the field, and the utmost rigidity is necessary. To prevent any appreciable drop in case a wheel breaks during use, a portion of the end frame in the form of a lug projects downward close to the rail; in some cases the bridge girders themselves extend across the rail and only slightly above it. These provisions also allow the end frame to be easily raised by wedges in order to remove the track wheels. (R. W.)

CRANE, FITTING-OUT—Any crane arranged and located especially for shipyard use in placing engines, boilers, guns, masts, stacks, armor, etc., in a ship after it is in the water. It is generally located on a wharf close to the water, or is a floating crane. The various types are all characterized by extremely large lifting capacity, a large clearance under the part extending over the ship, and a sufficient reach to cover the width of the ship, and sometimes more, in order to pick up material from a barge brought to the far side of the ship from the crane, (See Crane, Folding Jib Gantry; Crane Floating Gantry; Crane, Horizontal Rotating Cantilever.) (R. W.)

CRANE, FIXED—A crane whose principal structure is mounted on permanent or semi-permanent foundations. The area served is strictly limited by the dimensions of the moving parts of the crane, and neither the whole crane structure nor any considerable portion of it has any motion of translation during the operation of the machine as a crane. (R. W.)

CRANE, FLOATING—A crane mounted on a barge or pontoon which can be towed or self-propelled from place to place, and used for lifting and moving heavy weights at docks, ship fitting berths, etc., and for heavy marine work generally, including salvage operations. These cranes are generally of large size and capacity, and are built in various styles. Some are jib cranes, with a rotating jib of fixed radius, or with a variable radius, obtained by means of a trolley. Others have rotating booms of variable inclination. Gantries and shear legs are also used afloat, and for small work; stiff-leg and "a" frame derricks mounted on barges are common and are termed derrick boats or floating derricks. (R. W.)

CRANE, FOUNDRY—A name sometimes given to a rotary underbraced jib crane, with a trolley running on the top of the jib, and operated by hand or power. It has been extensively used in foundry practice, in capacities of one to ten tons. (See also Crane, Rotary Jib.) (R. W.)

CRANE, GANTRY, WITH INCLINED CANTILEVER—A crane used in handling excavated material and consisting of a gantry base central tower on which a long truss is supported at its center in a slanting position. A rope trolley handling a grab or bottom dumping bucket operates on the bridge, the motive power being located in the central tower, and the whole structure moves on a track under the tower. The lower end of the cantilever extends over an excavation like a canal, and the upper end over the spoil bank; the excavated material is carried from the excavation to the spoil bank by the bucket. (R. W.)

CRANE, GIRDER FRAME JIB—A type of rotary jib crane in which the mast and jib curve into each other and are substantially all one piece, being built up in a plate girder of box section composed of plates and angles as distinguished from Lattice Frame and Braced Jib Cranes. (Also called Fairbairn Jib Crane.) (R. W.)

CRANE, GUYED JIB—A jib crane in which the top of the mast is held in place by diagonal stays leading to anchorage in the ground at some distance from the base of the mast. (R. W.)

CRANE, HAND—A crane which is operated by human power. The usual method of applying it for hoisting is by means of a rotating crank. For travelling or swinging, the load may be directly pushed or pulled by hand, or by hand-operated cranks with appropriate rope or chain connections. (R. W.)

CRANE, HAMMERHEAD—Tower crane with cantilever horizontal arms of uneven length, the shorter or balancing arm having a counter weight something like the head of a hammer. The long arm carries the travelling hoisting mechanism. (R. S. M.)

CRANE, HYDRAULIC—A crane which is operated by hydraulic power. While smooth in action and almost unlimited in capacity, the system is so inferior to electricity in most other respects that hydraulic cranes are practically obsolete. (R. W.)

CRANE, INCLINED CANTILEVER JIB—A straight line type of travelling crane, developed particularly for transferring freight between the hold of a vessel and the inside of a wharf shed. The travelling structure, which is of the full or semi-portal type of gantry, or of the bridge type, travelling on the roof of the shed, carries on the end toward the water a double cantilever jib, with ends unequal in length. In its working position the jib is inclined with the short lower end projecting underneath the edge of the shed roof, and the long end extending upward

and out over the hatchway of the vessel. A load is hoisted from the hold with the trolley at the outer end of the jib; when clear of the hatchway the trolley is allowed to move upward and downward along the jib.

To allow the crane to be moved along the runway to different hatches, or to allow the vessel to be moved along the wharf, the jib may be raised to a vertical position against the end of the gantry or bridge, when it will clear all parts of the vessel and wharf. See straight line crane. (R. W.)

CRANE, INCLINED JIB—A jib crane in which the jib is inclined to the horizontal at a fixed angle. More power is naturally required to move the trolley up the slope, but other considerations often make the arrangement desirable. (See Crane, Inclined Cantilever Jib.) (R. W.)

CRANE, INDEPENDENT—A rotary jib crane supported clear of a wall so that it may make a complete swing, as distinguished from a wall crane which may swing through a half-circle only. (R. W.)

CRANE, INVERTED POST—An underhung crane consisting of a trolley travelling on an overhead bridge and having centrally fixed to it a downwardly projecting post on which a jib can swing in a horizontal plane beneath the bridge. The jib may or may not have a trolley; movement of the trolley and slewing of the jib may be by power or by hand. The hoisting is usually performed by any electric motor, carried on the jib. (See also Crane, Underhung; Crane, Horizontal Rotating Cantilever.) (R. W.)

CRANE, JIB—A crane consisting of a bracket frame, or of a vertical post from which extends a horizontal arm (see Jib) carrying a traveller or trolley (see Trolley) on wheels, from which the load is suspended. The load is raised or lowered by a suitable hoisting mechanism (see Hoist) suspended from, built into or acting through the trolley, and free movement along the jib is then allowed by the trolley wheels. The vertical post is usually pivoted at the top and bottom to allow swinging (see Crane, Rotary Jib), but when a bracket frame is used, it is often non-swinging and mounted on wheels to allow of motion along a track or runway. (See Crane, Traveling Jib.) (R. W.)

CRANE, LADLE—Any crane arranged especially for handling and pouring ladles of molten metal. The term is usually applied to overhead electric travelling cranes of large capacity, provided with a double set of hoisting ropes supporting a strong beam, from the ends of which long steel hooks support the ladle by trunnions at the sides. The double set of ropes prevents any turning tendency, and the use of the beam keeps the load blocks and hoisting rope away from the intense heat of the molten metal. Special precautions are taken to protect the whole equipment, mechanical and electrical, from the heat, dust and chemical fumes. (R. W.)

CRANE, LOCOMOTIVE—A rotary travelling crane consisting of a pillar crane with inclinable boom mounted on a turntable carried on a wheeled car travelling on tracks of standard or special gage. It is extremely mobile, has been built to handle loads up to 500 tons—though the cranes in most common use handle about 15 to 60 tons—it has a long reach, and may be adapted to a variety of uses. (R. W.)

CRANE, LUFFING—A crane in which the load may be moved radially, or to or from the center of the crane structure, by changing the inclination of the boom from the end of which the load is

suspended, as in a locomotive crane or derrick. This motion may incidentally be accompanied by a raising or lowering of the load, but the term luffing has reference to the horizontal motion only. (R. W.)

(Racking, side motion—Luffing lifting of boom.)

CRANE, MONORAIL JIB—A wall travelling jib crane with a fixed radius swinging arm. (See also Crane Walking Jib.) (R. W.)

CRANE, OVERHEAD ELECTRIC TRAVELLING—An overhead travelling crane, generally of the bridge type, operated by electricity. This method of driving is becoming so universal that the time is rapidly approaching when all such cranes will be either electrical or hand-operated. (R. W.)

CRANE, OVERHEAD TRAVELLING—A crane consisting of a steel bridge or girder structure supported at the ends on wheels travelling on elevated runways and having a trolley traversing the bridge—a hoist built into or hung on the trolley, and motors, gears, shafts, etc., for operating the machine, and apparatus for controlling it. (R. W.) Also called a shop crane. (R. S. M.)

CRANE, PIER OR RAISED PIER—A locomotive crane having a structural steel pillar or tower between the car body at the bottom and the turntable at the top, and serving to elevate the rotating pillar element and give it a greater length of hoist. (R. W.)

CRANE, PILLAR—A rotary crane, generally fixed consisting of a pillar or post held in a vertical position by attachment at its base to a turntable or equivalent mechanism which is securely fastened to the foundation, and a boom of fixed radius and inclination which meets the pillar near the bottom and is supported at its outer and upper end by a tie rod from the top of the pillar. No trolley is ordinarily provided, and the load may be moved horizontally around the circumference of a circle of fixed radius only. (Also called Transfer Crane, or Railroad Crane, from its wide use for transfer purposes in freight yads.) (R. W.)

CRANE, PILLAR JIB—A pillar crane with the usual self-sustaining post or pillar, but with the boom of fixed inclination replaced by a (generally) horizontal jib with a trolley running on it. The operating mechanism may be placed on a platform turning with the post, and opposite to the jib for counterbalance purposes. This crane is used in locations where guys or stiff legs for staying the top would be objectionable, but where the whole of a circular area must be served. (Also called Column Jib Crane.)

CRANE, PINTLE—A horizontal rotating cantilever crane on a tower, in which additional stability is given to the rotating element by rigidly connecting to it a braced pintle extending down within the tower a considerable distance, and mounted in a roller step bearing at its lower end. The roller bearing at the top of the tower is of the radial type and merely guides the rotating element. (Also called Hammerhead Crane.) (R. W.)

CRANE, POST—(See Crane, Pillar.) Also a small semi-portable jib crane arranged so that it may be bolted or clamped at the top and bottom of its mast to a post column or other part of a building structure. (R. W.)

CRANE, PORTABLE—A crane which may be easily moved from one location to another on skids, rollers or wheels and used, after such changes of location, for crane purposes. This occasional motion of the whole structure is not, however, for the purpose of moving the load.

The term is often applied specifically to a small pillar crane with built-in hoist, mounted on three wheels, and capable of being

hauled around a floor by hand with its load. The base is usually made so that it straddles the load to be picked up, and the pillar is curved so that the load can be delivered on top of a machine, provided there is room for the base beneath the machine. (R. W.)

CRANE, ROTARY—A crane in which the load is carried by a part or an assemblage of parts which are arranged to rotate about a vertical axis. Derricks, pillar cranes and jib cranes are examples of fixed rotary cranes; locomotive cranes, truck cranes and wrecking cranes are examples of travelling rotary cranes. (R. W.)

CRANE, ROTARY JIB—A jib crane which has a central post provided with pivots at the top and bottom so that the whole structure can swing about a vertical axis. If the load is carried at a fixed point at the end of the jib, it is called a swing crane; if the load is carried on a trolley, it is usually known simply as a jib crane, or, sometimes from its former wide use in foundries, as a foundry crane. Also called a mast jib crane. (R. W.)

CRANE, ROTATING CANTILEVER—A crane consisting of a central tower of four vertical members, supporting at the center a long truss on which a trolley can move from one end to the other. The central pier rotates on a circular track set on a suitable foundation; the area served is circular. (R. W.)

CRANE, ROUNDHOUSE—An overhead travelling crane intended for use in locomotive roundhouses, and travelling on runways which are arranged on the arc of a large circle. In order to make the bridge keep a radial position as it moves along the curved track, the outer end must travel faster than the inner, and this may be accomplished by having larger wheels at the outside, or by altering the gear ratio; the latter is preferable on account of the advantage of using the same wheels throughout. The individual wheel axes should be radial. (R. W.)

CRANE, SHIPYARD—The term applies to various types of cranes especially arranged and located for shipyard work, such as the delivering of the structural steel parts from the ground to the point in the hull where they are to be placed. They are characterized by a moderate load lifting capacity, a large clearance under the boom or jib, a sufficiently long reach to cover the necessary width of the building slip, and fairly rapid movement. (R. W.)

CRANE, SKEW—A bridge type crane in which the travelling bridge, instead of being at right angles to the runway is set permanently at a less angle. The squaring shaft runs at right angles to the runway, connecting diagonally opposite wheels on the end trucks. The bridge is of the monorail I-beam type, with open ends. A series of cranes of this type, arranged to travel on parallel runways transversely placed over a long floor area, can have trolleys run onto them from a single line of monorail runway by a single two-way switch for each crane, the runway being located along one side of the floor area, at right angles to the lines of bridge runway. (R. W.)

CRANE, SOAKING PIT—An overhead travelling crane used in steel works, having a trolley to which is attached, either above or below, with vertically moving parts, a rigid structure carrying tongs suitable for gripping a hot steel ingot and removing it from furnace pits in the floor to a car, or the reverse. It usually spans a standard or narrow gage railway as well as the soaking pits, sometimes called a vertical charging machine. (R. W.)

CRANE, STRIPPING—An overhead travelling crane specially arranged for lifting the ingot molds off the ingots in steel works.

A rigid structure hangs from the trolley, with two eyes which are caught under hooks on the top of the ingot mold, and which pull it upward. At the same time a vertically moving plunger pushes down on the top of the solidified metal, keeping it from rising with the mold.

CRANE, TOWER JIB—A jib crane, generally with a self-supporting steel mast or pillar, mounted on a tower. The mast is stepped at its base in a bearing well down in the tower, and is guided by a radial roller bearing at the top of the tower. The jib is attached to the mast just above the top of the tower, is top braced to the top of the mast, and carries a trolley. If the tower is of the travelling gantry type, the crane is called a travelling tower jib crane. (See also Crane, Horizontal Rotating Cantilever.) (R. W.)

CRANE, TRACTOR—A small travelling crane generally of the rotary pillar type, mounted on wheels and capable of self-propulsion over sufficiently firm ground. (R. W.)

CRANE, TRAM—A short bridge crane travelling longitudinally on overhead rails, without trolley motion. (R. W.)

CRANE, TRANSFER—A crane permanently installed in freight yards, etc., and used to transfer heavy weights between cars and trucks, etc. The term is usually applied to a fixed gantry, though travelling gantries, overhead travelling cranes and pillar cranes applied to this purpose are often thus designated. Also called Railroad Crane. (See Gantry, Fixed.)

Also, an overhead crane used to transfer a trolley with the use of switches. It generally consists of a travelling bridge which is so arranged that when it is properly located in line with one of the fixed runways, a trolley may be run onto it from the runway, and transferred to another runway by moving the bridge. The girder is generally underhung, so as to leave its ends open. Locks or stops must also be provided to keep the ends of the runways and of the bridge closed at all times except when they are properly in line for the passage of the trolley. (R. W.)

CRANE, TRAVELLING JIB—A jib crane mounted on wheels or trucks and arranged for self-propulsion. If the rails are on the side wall of a building, it is generally termed a wall travelling jib crane, and the jib is usually fixed, or without swing. If it runs on rails in the floor and is guided at the top by an overhead track it is called a walking jib crane, a velocipede crane or simply a travelling jib crane. (R. W.)

CRANE, TRUCK—A small revolving pillar crane of fixed radius mounted on a truck or small car for operation on industrial tracks or with flat tread wheels for use on smooth floors or the ground. The term is generally applied to the small hand-operated types lacking the self-propelling feature; the large power-operated truck cranes are really locomotive cranes, as they are provided with travelling gear. (R. W.)

CRANE, UNDERHUNG—An overhead travelling crane in which the bridge is hung to the end trucks below the level of the runway instead of above it, as is more usual. The runways usually consist of I-beams bolted to the beams of the floor above or to the roof trusses, and are often set in considerably from the end of the bridge, leaving a cantilever overhang at each end. Underhung cranes, suitable for light work only, are often used as transfer cranes, because the ends of the bridge girder are open, allowing a trolley to run off and onto a monorail track when the

crane is properly located. Also any crane in which a rotating jib or cantilever arm is hung beneath a trolley on a girder or runway. (See Crane, Horizontal Rotating Cantilever.) (R. W.)

CRANE, WALKING JIB—A travelling jib crane which runs on a single line of rails on the floor, and is guided at the top by a parallel overhead track. The base, having two swiveling wheels, or four wheels arranged on swiveling trucks, carries the motive machinery, and is strongly bracketed to the mast in the plane of the tracks. The swinging jib is either top or under braced, and may or may not have a trolley. The top of the mast carries guide rollers which run along the sides of the guide rail. This guide rail must be heavily braced to prevent the crane from overturning when the loaded jib is swung to the side. For stability when the load is in line with the track, dependence is placed on the long wheel-base and the heavy bracing to the mast. (Also called Velocipede Crane, or Travelling Jib Crane.) (R. W.)

CRANE, WALL BRACKET JIB—The simplest form of rotary jib crane, consisting of a horizontal beam or jib, often of I-beam section, hinged to a fixed point on a wall at one end, and supported at the other by a diagonal tie attached to the wall by another hinge directly above that holding the jib. Usually no trolley is included so that the load is carried at the end of the jib only, and the crane is often called a swing crane. The hinge plate of the tie rod is kept as high as possible so as to cut down the stress in the tie. If a trolley is used, it is hung to the lower flange of the I-beam. (R. W.)

CRANE, WALL TRAVELLING, OR WALL TRAVELLING JIB—A travelling jib crane which runs on horizontal lines of rails attached to one side of a building and extends outward over a portion of the floor space like a cantilever. The usual type has a structure consisting of a pair of top or under braced bracket frames rigidly braced together transversely, and carried by three rails; one at the top arranged to resist a pull outward from the wall, one at the bottom to resist horizontal inward thrust, and one at or near the bottom to carry the weight of the crane and load. A trolley runs on the horizontal part of the jib, with a built-in or independent hoist. The same variety of power equipment is supplied as with overhead electric travelling cranes—hand, electric or air hoist, and hand or electric trolley traverse and jib travel. (R. W.)

CRANE, WALL OR WALL JIB—A rotary jib crane supported against a wall and swinging through a half circle only, as distinguished from an independent jib crane which is so supported as to swing through a full circle. (See Crane, Wall Travelling; Crane, Wall Bracket Jib.) (R. W.)

CRANE, WHARF—Any crane, located on a wharf or pier, and particularly adapted to the transfer of cargo between the wharf or pier and the hold of the vessel alongside. Owing to the varying spacing of vessel hatchways, the crane must be capable of movement along the wharf, hence is mounted on a runway. Other requirements are: Sufficient horizontal reach to cover the hatchway, sufficient length of hoist to raise the load from the bottom of the hold to a point entirely clear of the vessel, and rapidity and economy of operation.

Types much used as wharf cranes are: Single or double portal gantries or travelling bridges on the wharf shed roof, carrying rotating pillar cranes; cantilever gantries with folding extensions over the hatchways; and gantries with inclined cantilever jibs. (R. W.)

CRANE, WRECKING—A crane used in railroad practice for clearing up wrecks. The type in almost universal use is a powerful travelling rotary pillar crane with a curved or angular boom of variable inclination, mounted on two trucks of four to sixteen wheels each; it is practically a very powerful locomotive crane, with special facilities for being hauled at high speed in a wrecking train. (See Crane, Locomotive.) It is generally steam-operated, even on electrified roads, as wrecks often destroy the neighboring electrical conductors. An especially heavy lifting tackle is arranged at a point about halfway out on the boom, and elaborate outriggers with jacks are provided to give the crane additional stability for side lifts at large radius. (R. W.)

CRITICAL VELOCITY—Of a current is one that will scour just enough to maintain the channel at the required depth. This is very difficult to determine in planning training jetties and other channel corrective works. (R. S. M.)

CRIBS—Are box shaped frames of timber constructed in open work, with numerous compartments formed by means of transverse and longitudinal ties. They range from 30' to 50' in length and are never narrower than the total height. The main timbers are 12 inches square—the lowest course or grillage 12"x18". After placing in position the cribs are filled with rock. This method of quay or mole construction is confined almost entirely to the Great Lakes. (Br. Cun.)

CRUSTACEA—A class of destructive wood boring animals. The three general species of importance being: *Limnoria*, *Chelura* and *Sphaeroma*, which see.

CUSTOMS SURVEYORS. DUTIES OF SURVEYORS WHERE COLLECTORS AND COMPTROLLERS OF CUSTOMS—At ports to which there are appointed a collector, comptroller of customs, and surveyors, it shall be the duty of the surveyor, who shall be in all cases subject to the direction of the collector: (a) to superintend and direct all inspectors, weighers, measurers, and gaugers within his port; (b) to report once in every week to the collector the name or names of all inspectors, weighers, gaugers, or measurers who are absent from or neglect to do their duty; (c) to visit or inspect the vessels which arrive in his port, and make a return in writing every morning to the collector of all vessels which have arrived from foreign ports during the preceding day; specifying (1) the names and denominations of the vessels, (2) the masters' names, (3) from whence arrived, (4) whether laden or in ballast, (5) to what nation belonging, and, (6) if American vessels whether the masters thereof have or have not complied with the law, in having the required number of manifests of the cargo on board, agreeing in substance with the provisions of law; (d) to put on board each of such vessels one or more inspectors immediately after their arrival in his port; (e) to examine whether the goods imported in any vessel and the deliveries thereof, agreeably to the inspector's returns, correspond with the permits for landing the same; and if any error or disagreement appears, to report the same to the collector, and to the comptroller of customs, if any; (f) to superintend the lading for exportation of all goods entered for the benefit of any drawback, bounty, or allowance, and examine and report whether the kind, quantity and quality of the goods, so laden on board any vessel for exportation, correspond with the entries and permits granted therefor; (g) (1) to examine, and, (2) from time to time, and particularly on the first Mondays of January and July in each year, to try the

weights, measures, and other instruments used in ascertaining the duties on imports, with standards to be provided by each collector at the public expense for that purpose, and (3) where disagreements or errors are discovered, to report the same to the collector; and (4) to obey and execute such directions as he may receive for correcting the same, agreeably to the standards. (U. S. S. B.)

CUSTOMS—COMPTROLLER OF CUSTOMS. GENERAL DUTIES OF COMPTROLLERS OF CUSTOMS—At ports to which there

are appointed a collector, **comptroller** of customs, and surveyor, it shall be the duty of the comptroller of customs: (a) to receive copies of manifests and entries; (b) to estimate, together with the collector, the duties on all merchandise subject to duty, and no duties shall be received without such estimates; (c) to keep a separate record of such estimates; and (d) to countersign all permits, clearances, certificates, debentures, and other documents to be granted by the collector.

Comptrollers of Customs shall examine the collector's accounts of receipts and disbursements of money and receipts and disposition of merchandise and certify the same to the Secretary of the Treasury for transmission to the General Accounting office.

They shall verify all assessments of duties and allowances of drawbacks made by collectors in connection with the liquidation thereof. In cases of disagreement between a collector and a comptroller of customs, the latter shall report the facts to the Secretary of the Treasury for instructions.

They shall perform such other duties as the Secretary of the Treasury may from time to time prescribe, and their administrative examination shall extend to all customs districts assigned to them by the Secretary of the Treasury. (U. S. S. B.)

D

DATUM—Agreed standard point of elevation noted by permanent bench marks on some solid structure from which water levels are measured. (R. S. M.)

DATUM PLANE—Level at datum or zero. (R. S. M.)

DAVIT—See Boat **Crane**.

DEAD CENTER—A position in a mechanism in which the part acting as driver cannot operate the other parts without outside help, owing to a locking action. In particular, the position of a reciprocating engine when the crank pins are on the line of centers, so that the pressure on the piston cannot move. (R. W.)

DEAD-END—To make fast the end of a rope used in hoisting or hauling operations, as the closing rope on a grab bucket, or a rope on a winding drum. (R. W.)

DEAD FREIGHT—When a charterer has failed to provide a full cargo for the vessel chartered, the loss thus accruing to the shipowner must be made up by the charterer, and this is called "dead freight." (J. Steph.)

DEAD-MAN—A prop or post used to elevate a derrick guy near its anchorage in order to allow more head room beneath it. It is usually a wooden post, set firmly in the ground at an angle, with the guy passing over a notch in the top. A grooved plate may be used to prevent the guy from cutting into the end grain of the wood. Steel dead-men are also used.

Also, an anchorage for a guy, cableway, etc., consisting of a tim-

ber or piece of structural steel buried in the ground with the end of the guy line fastened around its middle. (R. W.)

DECK—Orlop deck. The first deck above the lower hold

Upper orlop. The next deck above the orlop deck.

'Tween deck. The next deck above the upper orlop.

Steerage or main deck. The next deck above the 'tween deck.

Poop deck. A deck raised above the after part of a vessel. (Br.)

DECK, REVOLVING—The revolving platform or turntable of a locomotive crane. Also called the racer. (R. W.)

DEFLECTION—Of rope lead onto a sheave or drum. (See Deviation.) (R. W.)

DEGRADATION—The term applied to the breaking up of lump material like coal into smaller lumps or into dust, due to handling or other causes. The resistance of the material to degradation often determines the best method of handling to be used. (R. W.)

DEMOUNTABLE BODY SYSTEM—A system of motorized freight terminal transportation consisting of a fleet of trucks with standard demountable bodies, with electric crane and overhead rails at loading and unloading points, by which full and empty truck bodies may be exchanged with only a short delay to the truck. The contents of the bodies are unloaded and loaded in proper due course, and the system is so handled by a dispatcher that the exchanges are promptly made. Also sometimes called the Cincinnati System, because it was first installed there on a considerable scale. (See also Gattie System.) (R. W.)

DERRICK—Commonly used abbreviation of derrick crane. A rotary crane consisting of a vertical mast and means of holding it in a fixed vertical position, a boom, operating ropes and hoisting winch operated by hand or power. The mast is stepped at the bottom into a fixed baseplate and carries at its top either a loose cap or spider from which guys radiate to anchorages in the ground or other fixed points, or a pivot pin having its bearings held in place by gooseneck irons on the ends of stiff-legs. The boom is hinged at or near the base of the mast to allow motion in a vertical plane, and has its outer end or point raised or lowered by ropes attached to the point leading around a guide sheave at the top of the mast, and thence around other guide sheaves at its base, to the hoisting winch. This line is called the **topping lift** or **boom hoist**. The load is carried by a rope called the **load line** leading around a sheave at the boom point, thence along the boom to guide sheaves at the mast, and to the hoisting winch. The load, boom and mast are slewed about the vertical axis by a wheel at the base of the mast (see Bull Wheel) having slewing lines leading from it to the slewing winch or by hand slewing lines attached to the boom point or to the load; complete rotation requires that the guys or stiff-legs be spread so far that they will clear the point of the boom at least a portion of its range of elevation. (R. W.)

DERRICK, A-frame—An independent derrick in which the mast is replaced by two struts spread apart at the bottom and united at the top. A cross-bar furnished the point of attachment of the boom, and another spar or stiffleg (or sometimes two), extending to the rear, holds the top of the A-frame rigidly in position. The boom may be slewed somewhat less than 180 deg. by lines leading through guide sheaves on the side struts, or by a bull wheel.

Another type has a mast in addition carried in pivots just in front of the A-frame, so that it can swing the load through a full 180 deg. (R. W.)

DERRICK BOTTOM—The complete assemblage of metal parts at the base of a derrick mast, comprising the following parts or their equivalent; a foot block, secured to the bottom of the mast, having a pivot, either cylindrical or ball and socket, resting in the mast step in the base plate; a boom seat, either an integral part of the base plate, or secured separately to the mast above the base plate; straps and bolts for securing these irons in place; and one or more sheaves with their pins. (R. W.)

DERRICK, BREAST—A hoisting device consisting of a pole derrick having two poles spread apart at the bottom where they rest on a cross piece, and approaching or meeting each other at the top, where they are fastened together. Other crossbars connect the two poles, and a hand-winch is fastened to one of the lower ones, the load line passing around a sheave fastened to the top crossbar or top point. Guys hold the derrick in position, and by their adjustment provide a means for a small horizontal movement of the load. Generally portable, and used for small work. (R. W.)

DERRICK CAR—A truck or car on which is mounted a stiff-leg or A-frame derrick. The sills or lie legs may be bolted to a standard flat car and the stiff-legs attached to them in the usual way, or the frame of the car itself may be utilized for anchoring the stiff-legs. The mast and boom are sometimes arranged to lower to allow of hauling along a railroad right of way. (R. W.)

DERRICK, COUNTERWEIGHT—A small portable derrick consisting of a mast firmly fixed in a base and braced by short braces having pivoted to it a boom which has a short extension on the side opposite the load. This extension may be counterweighted by the hoisting winch and by additional weight if desired. The inclination of the boom may be changed, but neither it nor the mast rotate. (R. W.)

DERRICK, FLOATING—(See also Crane, Floating.) A derrick, usually of the stiff leg or A-frame type, mounted on a barge or pontoon. It is generally of moderate proportions and special provision must be made for stiffening the frame to resist the side stresses due to tipping when lifting a heavy load, and when acted on by waves. The slewing gear must also be powerful enough to swing the boom under any condition of side tipping. The derrick may be of the mast type with two or four stiff-legs of the A-frame type or with two stiff-legs of the A-frame type with a mast in addition. This last arrangement allows a full 180 deg. swing. The hoisting machinery is located on the deck of the barge where convenient, and considerable clear space is left in front of the derrick, so that the barge may be loaded and be used for water transportation, as well as for purely lifting purposes. (R. W.)

DERRICK, FULL CIRCLE—A derrick which has its mast so supported as to allow complete rotation. This is accomplished in a guyed derrick by having the guys spread far enough to clear the boom point. Stiff-legs of the "broken-back" type also allows complete rotation. (R. W.)

DERRICK, FULL-CIRCLE STIFF-LEG—A stiff-leg derrick arranged to swing a complete circle if desired. The two straight stiff-legs ordinarily used are replaced by "broken-back" stiff-legs, with a post, or strut supporting the leg at the angle of the break. The boom can then pass under the stiff-legs and make a complete circle. Two posts or struts are sometimes used to support the stiff-leg, giving better support against side yielding.

As at least two ropes ordinarily pass up into the mast through the bottom step, and these would be fouled by a complete turn, it is customary to mount the hoist on a platform at the bottom of the mast and rotating it, driven by a pinion meshing with large gear fixed to the foundation, called a **bull gear**. The weight of the hoist may be utilized to partially counterbalance the weight of the boom and load. Also called **full swing derrick**. (R. W.)

DERRICK, GIN HOLE—A pole derrick in which the single pole is stepped in a socket at the bottom to allow a small amount of inclination from the vertical in any direction by slacking the guys securing the pole top. (R. W.)

DERRICK, GUYED—A derrick in which the mast is held in a vertical position by guy lines, generally of wire rope, attached to a fitting at its top, and to anchorages in the ground distant from the base of the mast. Three such anchorages are absolutely needed, though more are always provided. The relative proportions of height of mast, length of boom and length of guys have an important bearing on the possibility of swinging the boom past the guys at certain of its elevations. Guyed derricks are always fixed, never movable or travelling. (R. W.)

DERRICK HOISTING WINCH—A term sometimes applied to a two-drum winch to which has been added a boom slewing gear, fitting it especially for handling a derrick with a bull wheel. When driven by a steam engine, sometimes incorrectly called a derrick engine. (R. W.)

DERRICK, INDEPENDENT—A derrick which has its mast so supported that it is independent of outside stays or guys, a derrick having a self-sustaining mast. (R. W.)

DERRICK, JINNIWINK—A special type of light A-frame derrick designed with a view to easy portability, for contractor's and similar work. (R. W.)

DERRICK MAST—The vertical strut, post or spar forming part of a derrick. It rests at its base or heel in the foot block forming part of the derrick bottom, and has at its top a **gadgeon** or pivot which is held in place by guys or stiff-legs, thereby holding the mast in a vertical position. It is built of wood in small and medium sizes, and of steel in medium and large sizes, generally of four angles with lattice bracing. (R. W.)

DERRICK, POLE—A boomless crane or hoisting device with a very limited horizontal motion of the load, and intended mainly for hoisting purposes. It consists of a pole resting on a cross-piece at its base, with its top held in place by guys, a sheave for the hoisting line at the top of the pole, and a hand-winch attached to the pole near the base. The horizontal motion is given by slacking on the guys. (See also Derrick, Gin Pole.) (R. W.)

DERRICK, SELF-SLEWING—A derrick in which the boom is slewed or swung about a vertical axis by power, through the medium of slewing lines and bull wheel, as opposed to one in which hand-power is used for this purpose.

Also a full-circle derrick in which the driving unit is mounted on a platform at the base of the mast, and rotates with it, power being applied to a stationary bull gear by a vertical shaft pinion driven from the hoisting winch engine. (See Derrick, Full-Circle Stiff-Leg.) (R. W.)

DERRICK, SHIP—A derrick especially arranged for handling the cargo of a ship. It consists of two booms attached to a mast by goose-necks, with the usual operating ropes and hoisting machinery. In operation, one boom is guyed with its point over the cargo hatch, and the other with its point over the lighter or wharf at the ship's side. A hoisting rope from each boom is attached to the load, and by proper manipulation of the hoisting drums is hoisted from the hold, swung over the side, and lowered. (See Cargo Handling Gear.)

The term derrick is also applied on shipboard to a spar raised on end, with the head steadied by guys and the heel by lashings, and having block and tackle attached to its head for lifting heavy weights. (R. W.)

DERRICK, SKID—A small portable derrick of the stiff-leg, or A-frame type, mounted with a hoisting winch on a platform resting on skids. Its capacity is very limited, except directly in front, unless temporary guys are arranged. (R. W.)

DERRICK, STIFF-LEG—A derrick in which the mast is held in a vertical position by two slanting struts or spars, called stiff-legs, or back-legs, attached to the mast cap at one end, and to anchorages in the ground at the other, the structure resembling a tripod with one vertical leg (the mast) and two other equal slanting legs (the back-legs), having their bases 90 deg. apart. The boom swings about the vertical axis of the mast through an angle of somewhat less than 270 deg.

For a portable derrick, the fixed anchorages are replaced by two horizontal sills or *lie-legs*, attached to each other at the base of the mast and there carrying the mast step, and extending along the ground to the basis of the stiff-legs, and secured to them. The sills are then anchored by heavy weights placed on them.

A third stiff-leg, or compression member, is often placed vertically just behind the mast to relieve it of the compression load it would otherwise carry.

Four stiff-legs are often used, especially in floating derricks (See Derricks, Floating.) (R. W.)

DERRICK, SUKLY—A portable hoisting device consisting of four poles mounted on two wheels, and when erected for use, forming a rectangular pyramid secured by bolts and hinges at the apex where means are also provided for securing block and tackle. Two of the poles are rigidly braced to each other by crossbars, the lower of which bear the hoisting drum and gearing which is operated by turning two large wheels at the ends of the shaft by hand. The other two legs are separately hinged at the top. For transportation, the framed poles are tipped over until the wheels rest on the ground, the two independent poles are folded down on the others.

Also called trench derricks, from its wide use over a trench for lowering pipe, etc. (R. W.)

DERRICK, TOWER—A stiff-leg or A-frame derrick mounted on an elevated structure in order to obtain high lift and large clearance under the boom. The structure is sometimes triangular in plan with vertical corner posts under the mast and each of the two stiff-leg ends. Sometimes it is square, with two stiff-leg derricks mounted on diagonally opposite corners, or rectangular with two stiff-leg derricks at adjacent corners, the stiff-legs being arranged with different slopes to allow of their crossing. Occasionally three separate towers are built, one each under the mast and the two stiff-leg ends.

A stiff-leg derrick has also been mounted on an adjustable turntable on top of a tower in such a way that the mast could be brought over any one of the four corners of the tower as desired, and clamped there, the mast being swung by a bull wheel as usual. The rear ends of the sills are clamped down to the tops of the two adjacent corner posts.

Also, in building construction in locations where long guys cannot be used, a well braced wooden tower, with short iron guys to heavily loaded extended sills at the bottom, is used to support one or more derricks at the four corners. The tower is lengthened and derricks moved upward as the building progresses. (R. W.)

DERRICK, TRAVELLING STIFF-LEG—A stiff-leg which is mounted on a car or wheels. One type is carried on two widely spaced rails; one sill is parallel to and over the rail, and carried by non-swiveling track wheels at each end, and the other sill is at right angles, with its far end carried by a wheel or truck on the other rail. A horizontal diagonal tie keeps the sills at right angles and insures rigidity, and the remote ends of the sill are often weighted with boxes of earth or stone. The load is also sometimes counterbalanced by counterweighing the bull wheel on the side opposite the boom. (See also Derrick Car.) (R. W.)

DERRICK, TRIPOD—A hoisting device consisting of a pole supported in an inclined position by two props, having a crab on the pole near the base, and a sheave at its top. Generally portable, and used for small work. (R. W.)

DEVIATION—The departure from a fixed or previously stated sailing course or ports of call.

Deviation Clause—in the B/L. permits a ship to change it announced itinerary.

Of rope lead onto a sheave or drum. The angle between the center of the rope and the central plane of the sheave or groove. A deviation which brings the rope barely into contact with the slanting side of the groove is not objectionable; more will wear the rope, or may cause it to jump the groove.

Also called deflection, and side draft. (R. W.)

DIAPHRAGM, OR DIAPHRAGM PLATE—A transverse plate fitted inside of a box section steel girder, to stiffen the sides and prevent buckling. It is used in overhead travelling crane girders, both in the bridge girders and in the end frame. In the former it also serves to stiffen the top plate and enable it to carry the load on the rail. (R. W.)

DIAPHONE FOG SIGNAL—An American development of a distinctive sound, aid to navigation, a horn blast ending in a grunt. The range is up to 40 miles. Due to the characteristic of the tone quality this fog signal cannot be mistaken for other sounds such as steam whistles. (Shank. R. S. M.)

DITCHER, RAILROAD—An excavating machine designed especially for efficient operation in cleaning out the ditches along the right-of-way. The requirements are to dig somewhat below the track level and close to the ends of the ties; to deliver the excavated material to cars on the same or adjoining tracks; and to have the power of self-propulsion (unless a locomotive can be spared to accompany the ditcher.) (R. W.)

DIVING DRESS—(1) Ship connected, with pump aboard vessels and air tube to the diver, (2) self contained diving dress has an air pressure tank, and an oxygen tank and a "gas mask" or air regenerator of chemicals that convert CO_2 gas into pure oxygen so that it may be breathed again. (Shank. R. S. M.)

DOCKING—See tow boat charges.

DOCKABLE PERIOD—The time during which the stand of water and current will permit a vessel to enter her dock. Dock entrance design must give this consideration. (Shank. R. S. M.)

DOCUMENTS—(1) Ship's papers, (2) Financial Papers, a draft in duplicate with a full set of Bs/L. (3 or 4 signed copies according to the number of signed copies noted on the B/L.) Insurance certificate, commercial invoice, consular invoice or certificate of origin.

DOG—A piece of metal used in conjunction with a larger body to act as a clamp. A part of a clamp. Also, a steel rod with two ends pointed and bent up at right angles to hold together logs or timbers by driving one leg into each of them. Also a single pointed steel piece with a ring or chain attached, for handling floating timbers. (R. W.)

DOLLEY—A small single-wheel truck used in transporting moderately heavy bodies for short distances. It consists of a heavy rectangular frame, generally of wood, on the underside of which are secured bearings carrying the shaft of a wide faced wheel or roller. The object to be moved is placed with its center over the roller, or two dollies are used, one at each end of the object. (R. W.)

DOCKING—See Tow Boat Charges.

The operation and the charge for performing the operation of a tow boat or tug for assisting a vessel into her berth—opposite operation is **undocking**. (R. S. M.)

DOMESTIC VOYAGE—Voyage of any vessel enrolled or licensed to engage in the coasting trade on the northern, northeastern and northwestern frontiers of the United States or any other coast-wise or intercoastal voyage. (U. S. S. B.)

DOWNHAUL BALL—See Cheek Block.

DOWNHAUL BALL—In hoists, a heavy weight interposed between the hook and lifting block, or built into the lifting block to furnish sufficient pull to make the hoist or tackle overhaul when it is desired to lower without load. (R. W.)

DRAG LINE EXCAVATOR—An excavating machine consisting of a drag scraper or a scraper bucket operated by a crane, derrick, slack-rope cableway or other similar apparatus. When used with a crane or derrick the bucket is handled by two ropes; one of these, the hoisting rope, leads over a sheave at the boom point and thence to a winch drum. The pulling or drag rope from the bucket leads directly to another drum on the winch. The bucket is dragged along the ground toward the winch by the pulling rope, and fills, owing to its shape and method of attachment to the pulling bridle. (See Drag Line Scraper Bucket). When full it is raised from the ground by the hoisting rope, swung to the point desired, dumped, returned, lowered to the ground, and is ready for another trip. (R. W.)

DRAG LINE SCRAPER—A scoop-shaped implement used for moving bulk material by a scraping action. It is attached to a line led to a winch, and is dragged over the material to be moved, heaping it up in front and sliding it along partly in the scoop and partly on the surface of the material in front. It is returned by a line attached to its rear side, which also dumps it when pulled. Used for excavating, also in connection with storing and reclaiming coal in bulk in storage piles. (Also called drag scraper scoop; drag scraper.) (R. W.)

DRAG-ROPE—In drag bucket installations the rope which pulls the bucket or scraper along over or through the material. (See

Excavator; Drag Line Excavator, Slack-rope Cableway.) As this rope gets very rough treatment, it must be of the very best material and have ample margin of strength. (R. W.)

DRAG SCRAPER—A horse-drawn, scoop-shaped pan made of one piece of stamped steel and used for light excavating. It has handles at the rear and a pulling bridle at the front for attaching a team of horses. The scraper is made to dig by lifting on the handles by hand; when the scraper is full they are dropped and the scraper rides on the smooth bottom to the dumping point. Here a large lift of the handles causes the cutting edges to dig in sharply and turn the scraper over. (R. W.)

DRAW-BAR—A bar by which a locomotive draws a car behind it or a tractor its trailer; also a similar bar used between two cars or two trailers. (R. W.)

DRAWBACK—Merchandise entered for consumption when re-exported providing it has not lost its identity and can be satisfactorily identified as the identical merchandise imported will recover 99% of the duty paid. (U. S. S. B.)

DRAWBAR PULL—The pull exerted by a self-propelled vehicle in drawing or trying to draw a load behind it. Ideally it is equal to the tractive effort, but practically is always less on account of certain resistances of the vehicle itself. (R. W.)

DRAWING, COLD—The process of drawing metal bars of various shapes through dies while cold, in order to improve the finish, the quality of the surface metal, or to size the bar very accurately. (Sometimes erroneously called Cold Rolling.) (R. W.)

DREDGE—A machine for excavating material at the bottom of a body of water, raising it to the top and discharging it on the bank, or into a scow for removal to a distant point. Dredges may be classified as **floating dredges** which are mounted on a scow or other floating craft, or **land dredges** which travel on land, but are used for excavating beneath the level on which they stand, and generally beneath water. Floating dredges may be classed as (1) **grapple dredges**, in which the digging element is a grab bucket operated by ropes; (2) **dipper dredges** in which the digging element is a bottom dumping bucket mounted on the end of a long handle or boom; (3) **ladder dredges** in which the digging element is an endless chain bucket elevator extending down into the water on a frame or ladder; and (4) **suction dredges** in which the excavated material mixed with water is drawn into a centrifugal pump through an intake pipe reaching down to the bottom and discharged onto the bank or into a scow.

Land dredges are classified as **track, skid, or roller, tracklaying or walking**, according to the method of moving them, and as **grapple, dipper, or drag line scraper bucket** according to the method of digging the underwater material.

Land dredges are also often called excavators, even where they remove material from beneath water. (R. W.)

DREDGE, DIPPER—A floating dredge in which the digging element consists of a dipper mounted on a handle, and operated from a boom which may be swung about a vertical axis, the whole being mounted on the front end of a scow. Except that it has a longer boom and dipper handle, and a higher A-frame, it is substantially the same as a steam shovel. The scow is usually not self-propelled, and deposits the soil on banks beside the body of water being dredged, or into bottom dumping hopper scows for dumping elsewhere. (R. W.)

DREDGE, ELEVATOR—A dredge which removes material from the bottom of a body of water and delivers it to a discharge hopper or other desired point by a series of scraper buckets attached to a chain, and passing around a vertical frame or ladder with tumblers at each end, and driven by the upper tumbler. The material is scooped up while the buckets are passing around the bottom tumbler and is dumped as they pass over the top one. It is capable of digging to considerable depths and in fairly hard material, and is used to some extent for deepening channels, and rather generally for gold dredging. It is also widely used for procuring sand and gravel from submerged banks, to be used for building purposes. The buckets dump into a screening mechanism, and the sand, gravel and boulders are separated, the last being dumped overboard to the rear if not desired.

Also called **placer dredge**, **ladder dredge**, and **chain and bucket dredge**. (R.W.)

DREDGE ENGINE—The engine—steam or internal combustion—which drives the machinery of a dredge. Steam engines are in more general use, and are usually of the double reversing type, connected by gearing to one or more shafts on which the operating drums are placed.

The term is also often applied to the engine and all operating machinery driven by it, including drums, shafts, clutches, brakes and operating gear. (R.W.)

Recent large dredges have been Diesel-Electric. (R. S. M.)

DREDGE, GRAPPLE—A dredge in which the digging element is a grab bucket of the clam shell or orange peel type. The grapple is used extensively on both land and floating dredges. (R.W.)

DREDGE, GRAVITY SWING—A grapple dredge in which the relative location of the swing circle and topping lift is such that the boom tends to swing to one side. It is allowed to swing thus after the bucket has been filled and hoisted; after dumping it is pulled back by a rope wound on a drum on the winch, or by a counterweight on a holding drum, the weight of which is sufficient to overcome the side pull of the empty bucket, but not that of the full bucket. (R.W.)

DREDGE, HYDRAULIC—A machine for excavating material from river channels, harbors, etc., widening and deepening them, by drawing it into a centrifugal pump through a suction pipe having its end thrust into the material. Soft material will be removed without agitation, or with only that produced by water jets, but tougher substances must be acted upon by an agitator which usually takes the form of a rotating head with cutting blades surrounding the orifice in the suction pipe end. The suction pipe is pivoted on a horizontal axis at the bow of the scow.

The discharge of the pump is led ashore by a flexible line of piping which may extend as far as a couple of miles,* or is led into bottom dumping scows, to be carried to a suitable dumping point. (*3500 yards is about the limit without a booster.)

In large bodies of water the dredge is swung from side to side and advanced slowly at each sweep, by the manipulation of spuds and guiding ropes. In narrow canals the suction pipe itself is swung from side to side while the dredge is moved slowly forward.

A hydraulic dredge is also often used for supplying sand and gravel from submerged banks for building purposes, and is

usually called a **sand sucker**. The pump delivers the material to screening machinery, and the sand, gravel and boulders are separated, the last being deposited to the rear if not desired. (R. W.)

DREDGE, LAND—An excavating machine which is moved along on dry land, but does its excavating under the water which it spans, or along the side of which it runs. (See Dredge.) When it does dry excavating it is usually called an excavator. (R. W.)

DREDGE, RE-HANDLING—A floating dredge which takes the discharge from sea-going hopper dredges and pumps it ashore. This system is used where it is impossible or uneconomical for the hopper dredge to go to sea to dump, and where it is not possible to pump the material ashore at once from the dredge on account of rough water or for other reasons. (R. W.)

DREDGE, SEA-GOING HOPPER—A self-propelled hydraulic dredge which delivers the excavated material to bottom dumping hoppers within its own hull, and carries it to the dumping ground in deep water or elsewhere, by its own propelling machinery. These dredges usually have the suction pipe along side the ship, pivoted at a point approximately amidships, and trailing to the rear. (R. W.)

DREDGE, TRACK TYPE LAND—A land dredge which is supported by flanged wheels running on rails. The sections of rails may be moved forward after the dredge has passed over them, by the machine itself, or by outside means. The dredge may be hauled forward by ropes attached to deadmen set in advance of the machine, or to the ends of the rail sections on which it is supported. (R. W.)

DREDGE, WALKING LAND—A land dredge or excavator which is built on a deck or platform spanning the ditch to be excavated and which is supported on six skids in such a way that it may be propelled forward by their proper manipulation. There is one skid at each corner of the dredge platform which may be moved up or down. Other larger movable skids, called walking skids, on each side between the front and rear corner skids, are also capable of being raised or forced down, and of being moved along from front to back or the reverse. In operation, the walking skids are moved forward and forced downward until they take a considerable portion of the weight off the platform which is then pulled forward by rope tackle attached to the walking skids and handled by the winch. The walking skids are now relieved of the weight, which is transferred to the corner skids, and the dredge is moved forward, after which the cycle is repeated as many times as may be necessary. This method of propulsion enables the machine to pass over land which is too soft for most other types of excavating machinery, and in addition saves the cost of tracks. (R. W.)

DRIFT—The term applied to the continued movement of crane or other machinery, due to inertia after shutting off the power. Friction tends to bring the parts to rest, and drifting does no harm if fully under the control of the operator by brakes which can be applied if needed. Rapid action, however, generally requires the use of brakes and the elimination of the period of drifting. (R. W.)

DRIFT. (noun)—The distance the cargo has to be dragged in the hold before reaching the hatch opening. (Br.)

DRIFT ANGLE—(Of a ship when turning)—The angle between the middle line of the ship and the tangent to the path at any

particular instant is the drift angle. Its amount varies in different classes of ships, and also at different points of the path. Newer ships, turning more quickly have greater drift angles. When the helm is put over the effect on the ship is to force the stern to the side of the original course. The stern does not clear the original course line until about 6 points are turned. The stern sometimes sweeps out as much as 50'. If the drift angle is large the resistance of the ship in the direction of the path is large. (Shank.)

DRUM, FRICTION—A winding drum which is driven from its shaft by a friction clutch. The clutch is generally of the cone type, with wedge shaped blocks of wood or bronze fastened in a circle to one of the parts (usually the drum gear keyed to the shaft) and is capable of being forced axially into a corresponding groove in the other part (usually the drum) the resulting friction being sufficient to make them revolve together. When "out," the drum is free to turn unless retarded by a hand brake. A ratchet and wheel are also supplied to hold the load independently of the brake; the ratchet must be thrown out of action when lowering by the brake. (R. W.)

DRUM, FRICTION GEARED—A winding drum which is rotated by friction gearing. (R. W.)

DRUM, GRAVITY PLANE—A brake controlled drum used for simultaneously lowering a loaded car and raising an empty one on a gravity plane. Two separate ropes are used, one coiled in each compartment of the two-compartment drum, with one end attached to the drum and the other to one of the cars, the winding being done in opposite direction. A band brake controls the motion of the drum overhauling under the weight of the load in the loaded car. (R. W.)

DRUM LAGGING—Wooden strips which may be bolted between the end flanges of a winding drum to increase its diameter and increase the speed of hoisting, with, of course, a corresponding decrease in the pull which may be exerted. They may lie on the original surface of the drum, or may be considerably above it, and be held in position by bolts through the flanges.

DRUM, OUTBOARD—A winding drum mounted separately from the rest of the drums in a winch and driven either separately or by gearing from the engine driving the main winch. It is generally located to one side, though sometimes in line with one of the other drums, or because it is temporarily added to the main winch to obtain an extra drum. (R. W.)

DRUM, PEAKING—A term sometimes applied to the drum of a crane or derrick winch which handles the boom hoist or topping lift. (R. W.)

DRUM, STORAGE OR CABLE STORAGE—A winding drum which has a considerable capacity for cable, for use under widely different conditions as to length of hoist or haul. Such conditions arise in building operations as the successive floors are reached. In particular, a derrick slewed by a bull wheel must save some such provision for lengthening the slewing line if used in building operations. (R. W.)

DRUM, TAG LINE—A small winding drum which keeps up the slack and maintains a slight tension in a tag line attached to the load lifted by a crane, dispensing with the services of a tag-man. It is often driven by a drag clutch on the main shaft of the hoisting winch. (R. W.)

E

ECCENTRIC—A form of crank in which the crank pin is enlarged in size so as to include the shaft, thus becoming the crank web and crank pin in one. It is nearly always used in connection with a surrounding or enclosing eccentric strap, which is attached to an eccentric rod, and produces a reciprocating motion of the remote end of the eccentric rod. (R. W.)

ECHO MEASUREMENTS OF HORIZONTAL DISTANCE—Similar experiments to those used in sounding have been made since 1914, to ascertain ocean surface distance on objects such as icebergs. (Shank. R. S. M.)

ECHO SOUNDING—See Sonic Depth Sounder.

EFFICIENCY—The ratio of output to input, or of useful work done to total work done, or of result accomplished to effort made. It cannot equal unity in any actual mechanism because of friction, and usually falls far below it. (R. W.)

ELDER BRETHREN OF THE CORPORATION—(Trinity Masters)—As nautical assessors, assist the judges in the Admiralty Division and other judges, as required in shipping cases. (Trinity House, London.) (Shank.)

ELEVATOR, AUTOMATIC ELECTRIC—An elevator which can be started by a system of push buttons and brought at the floor where it is desired without any operator being present in the car. The A. S. M. E. Code defines an automatic button-control elevator as an elevator the operation of which is controlled by buttons in such a manner that all landing stops are automatic. They are widely operated on both alternating and direct currents and at 110 to 250 volts. (R. W.)

ELEVATOR, AUTOMATIC FLOOR LEVELLING MACHINE—A device for automatically insuring accurate landings irrespective of load and speed, and of automatically maintaining this accurate landing during loading and unloading irrespective of the stretch of the cables. (R. W.)

Also called **micro elevator**, or micro-levelling elevator. The operation is accomplished by means of a small auxiliary motor, operating with very low gear and moving the winding mechanism after the main motor is shut off. (R. S. M.)

ELEVATOR, BELT—An elevating apparatus consisting of an endless flat or troughed belt passing around head and tail pulleys and over immediate supporting idlers, the whole being set at an incline and driven in such a direction that material deposited on the upper run will be carried upward and be discharged over the head pulley.

The belt may be flat or troughed, the latter having greater capacity; it may have cleats or cross strips to prevent lumps from rolling down or packages from sliding, or when the inclination is steep it may have deep pockets or buckets.

The details are similar to those described under Conveyor, Belt, except that no tripper is used since the discharge is always over the head. (R. W.)

ELEVATOR, BELT AND BUCKET, OR BELT BUCKET—A bucket elevator in which the buckets are fastened by their backs to an endless belt of fabric, which travels around head and foot pulleys having considerable crown. (R. W.)

ELEVATOR, BUCKET—A continuous elevator, consisting of a traveling endless belt, of fabric or chain, to which buckets are attached and which moves in such a direction as to raise material fed into them at the bottom, and deliver it by inverting them

at the top. Pulleys or sprockets are mounted on the head and foot shafts at line vertically, or offset so that the lines of buckets between them are inclined, the ascending side being the upper one when thus inclined. The head and foot shafts are mounted in a frame and left open, or enclosed in a head casing and boot respectively which are connected by a casing or trunking in the fully enclosed elevator. (R.W.)

ELEVATOR, CHAIN AND BUCKET, OR CHAIN BUCKET—An elevator in which the buckets are fastened to one or two strands of chain. (R.W.)

ELEVATOR CHAIN PUMP—A pump consisting of an endless chain on two sprockets, having disc attachments at intervals closely fitting the inside of a pipe into which the chain passes at the bottom under water, and up which it is drawn lifting the water caught between the discs. (R.W.)

ELEVATOR, CONTINUOUS BUCKET—A bucket elevator in which the buckets are placed in a continuous line along one or two strands of chain or a belt, allowing feeding to be accomplished from a chute, and using the front of one bucket as chute for the discharge of the next following one on passing over the head wheels. (R.W.)

ELEVATOR, DEWATERING—A bucket elevator having its buckets made of perforated metal or woven wire, so that water can drain away from the material raised. A draining elevator. (R.W.)

ELEVATOR, DOCK LEG—A two strand vertical bucket elevator which is suspended from the top by a structure erected on a wharf, and which can be lowered into the hold of a vessel for the purpose of unloading bulk cargo. The lower shaft is hung in the bights of the chains, no casing being used, and carries a boot which is open at the bottom and therefore self-feeding. In some arrangements the chain and buckets, of the gravity discharge V-type, are continued on a horizontal run at the top as a conveyor and carry the material over a storage bin where it is dumped. In other cases, the material is discharged as the buckets pass around the head sprockets, on to a horizontal conveyor for further movement.

The drive is through the top sprocket.

Also called a dock leg unloader. (See Elevator, Marine Leg.) (R.W.)

ELEVATOR, FINGERED—A continuous package elevator having its rigid arm or suspended tray formed of a series of parallel fingers projecting from one or both sides of a bar which is attached to the one or two chains of the elevator, and used in conjunction with similarly fingered loading and unloading platforms. A load resting on a platform is picked up by the fingered moving platform coming up from beneath it and passing between the fingers. Moving downward it will be deposited on a similarly fingered discharge platform, and if this be sharply sloping, the load will immediately slide out of the way of the next following car. The fingers may be curved to fit around objects, flat to hold boxes and trays, or combination, with a curved middle portion and straight ends. (R.W.)

ELEVATOR, GIG—A small intermittent platform elevator travelling in guides in a vertical shaft, and used for handling articles uniform in size, such as boxes, cakes of ice, etc. The box or cake in the loading runway is automatically released and slides onto the elevator platform when the latter has reached the bottom; it is then hoisted, and on reaching the desired height,

slides out onto the delivery platform owing to the permanent slope of the elevator platform. Adjustable automatic stops limit the travel of the elevator, which can be made entirely automatic. It can be used for lowering by reversing the direction of the slopes. (R. W.)

ELEVATOR, HYDRO-PNEUMATIC—An elevator operated by a cylinder with a plunger or piston, and a combination of air and hydraulic power (water or oil.) Since air is compressible, the load cannot be removed from a straight compressed air elevator at any other point than the top or the bottom of the travel (where the car is against stops.) More than two levels can be served, however, if oil only is used in the elevator cylinder, but is forced into the cylinder by air pressure on top of it in the storage tank. When the air is released the elevator will descend, but motion can be arrested at any point in either direction, and the car locked by closing a valve in the oil line between the cylinder and tank. The action is like a hydraulic elevator without pumps, the source of compressed air supplying the power. (R. W.)

ELEVATOR, MARINE LEG—A vertical bucket elevator used for unloading bulk material (generally grain) from vessels at a wharf, which is supported from the elevator structure in such a way that it can be adjusted vertically and horizontally at right angles to the wharf line in order to reach as much of the hold of the vessel as possible. It is similar to a dock leg elevator (see Elevator, Dock Leg) except that the chain sprockets are usually carried in a rigid frame and the leg is completely cased, instead of the lower sprockets and boot being simply hung by the exposed bucket chains. The discharge is over the head sprocket, through a spout to a storage bin, and to a horizontal conveyor or to another bucket elevator for delivery to its destination in the building. (R. W.)

ELEVATOR, (1) PNEUMATIC—An elevator which is operated by air pressure on a piston moving in a cylinder, the cylinder and attachments being practically the same as in air cylinder hoists, which see, the car moves in guides, rests on stops at the bottom, and against similar stops at the top, which limit its travel. (R. W.)

ELEVATOR, (2) PNEUMATIC—A spout or tube conveyor of free flowing materials such as hard grains, dried copra, etc., but especially wheat actuated by a pump creating a vacuum—air suction. (R. S. M.)

ELEVATOR, PATERNOSTER—For freight and passengers, operates on the principle of the Tray Elevator (which see) the cars carry one or two persons. The passenger steps into the car or off again as the cars pass the floor, the speed being slightly faster than an Escalator, which it resembles in that it is continuous motion and the passengers steps on and off. This type is used in many office buildings, in Europe, especially Hamburg, where the buildings are large and busy, but limited in height to six stories. The Paternoster gives continuous service without waiting, without operator and at low current consumption as all fixed loads are absolutely balanced. There are 20 to 24 cars on the chain which gives it the name—like prayer beads. The popular etymology is that you say your prayers before you get it. There have been several hundred running in Hamburg for years and accidents are practically unknown. (R. S. M.)

ELEVATOR, PLUNGER—A hydraulic elevator having a ram or plunger directly attached to the under side of the car platform. (A. S. M. E. Code.) (R. W.)

ELEVATOR, SACK—An elevator especially adapted to handling sacks of grain, flour or similar articles. Sacks may be slid easily on smooth surfaces, and do not require smooth level platforms for their transportation, but must not be torn or caught by projecting parts about the conveyor. (R. W.)

ELEVATOR, SCREW—A machine like a screw conveyor, with the axis of the screw placed in a vertical direction and enclosed in pipe, and used for elevating material supplied to it at the bottom. As continuous feed must be arranged, intermediate bearings are omitted, and the pitch should be less than with horizontal conveyors. It will operate successfully on certain materials whose particles cling, like ground cork, cotton seed, etc. (R. W.)

ELEVATOR, STEAM—An elevator in which the motion of the car is obtained by a steam engine directly applied to the elevator machinery. (A. S. M. E. Code.) The steam elevator is now obsolete except in so far as its operation is continued in a few old installations. The rope lifting the car was usually wound around a drum turned by a steam engine. However, the traction elevator principle also was applied to some extent on steam elevators. (R. W.)

ELEVATOR, TRACTION—A type of electric elevator in which the car motion is obtained by means of adhesion between the driving sheave and the hoisting cable. There are two classes of traction elevators known as the direct or gearless traction and the geared traction machine. Either herringbone or worm-gear traction machines may be constructed. All direct traction and herringbone geared elevators are for high speed cars, and are the only elevators giving satisfaction for high speed service. Worm-gear elevators are for medium speed car operation. The direct traction elevator operates with direct rather than a geared connection between the motor and driving sheave, the gearing being eliminated by the use of a specially designed very slow speed motor. (R. W.)

ELEVATOR, TRAY—A continuous vertical elevator operated by one or more endless chains passing around sprockets at the top and bottom, and carrying wooden or metal trays rigidly attached to them, or suspended by pivots. (See Elevator, Tray, Suspended; Elevator, Tray, Three Chain.)

An elevator in which the trays are rigidly attached to the chains will discharge its load in passing over the head wheels, unless it is removed by some special means like a contact discharge cam while ascending. If loaded on the ascending run, it will discharge at the bottom by tipping the trays downward as the chains start to pass around the foot wheels. If a fingered tray is used, it will discharge at any point in the descending run. (See Elevator, Fingered.)

Also called a package elevator. (R. W.)

ELEVATOR, TRAY, SUSPENDED—A package elevator consisting of a series of equally placed platforms or trays attached to two vertical endless strands of chain passing around sprockets at the top and bottom. The trays are suspended at each end by rigid diagonal hangers meeting at a pivot attachment on the carrying chain; the tray thus naturally hangs level and remains so in passing around the head wheels. Trays are usually sym-

metrically hung; occasionally they are suspended from points on opposite sides near diagonally opposite corners. Close hung trays will not interfere with a through-shaft at the head; trays hung a considerable distance below the pivot, as required for carrying large objects, will strike the head shaft, which must, therefore, be eliminated by driving the two sprockets, each overhung on its own short shaft and carrying a large spur gear, by a transverse shaft with two pinions, placed below the sprockets and their spur gears.

Solid bottom trays may be loaded or unloaded automatically or by hand, generally the latter. Fingered trays are usually arranged for automatic loading and discharge.

Suspended trays may be carried on inclined or horizontal runs with equal facility. (See Carrier, Suspended Tray.)

Also called a swinging tray elevator. (R. W.)

ELEVATOR, UNI-STRAND—A continuous vertical chain elevator consisting of a single strand of chain passing around sprockets at the top and bottom. Attached to the edge of this chain, and standing out perpendicular to the plane of the sprocket wheels, are rigid arms shaped to hold special packages or platforms for boxes or trays, fingered if desired. The platforms are attached to the lower ends of vertical links, and the pivoted point of attachment to the chain is a point at either the top or the middle of the vertical link. In the former case a roller on the lower end of the link runs in a guide parallel to the chain in such a way as to positively keep the arm vertical; in the latter, points at both top and bottom of the vertical link are thus guided.

Loads are picked up on the upward run (unless placed by hand on the downward run) and pass around the head, unloading automatically on the descending run on fingered receiving platforms. The elevator is driven at the head by a geared motor. (R. W.)

ELEVATOR CAR-LEVELLING DEVICE—A mechanism the purpose of which is to move the car automatically toward the landing level from either direction and to maintain the car platform at the landing level during loading or unloading. A levelling device, however, may also be used for the emergency operation of the car. (A. S. M. E. Code.) (R. W.)

See Mirero Leveller.

ELEVATOR CAR SLING, STIRRUP—The frame encircling an elevator and supporting it, consisting of the upper cross-member to which the hoisting cables and guide shoes are usually attached; the car-posts or stiles; and the cross-members, which supports the car sills, platform and guide shoes. (R. W.)

ELEVATOR CASING—The housing or enclosure within which a bucket elevator operates. Casings are made of wood or steel, combined with cast iron or steel boots and head casings. When the two lines of buckets are cased separately, it is known as a double leg casing, and sometimes round; otherwise it is single leg, and is always rectangular in cross section. The casing is often omitted and the head and wheels held in position by framing. Also called trunking and legging. (R. W.)

ELEVATOR CLEARANCE—At the top of the hoistway is the vertical distance between the lowest point of the superstructure and the highest point of the car enclosure or crosshead when the car is at the limit of the over-travel at the top. Clearance at the bottom of the hoistway is the vertical distance between the floor of the

pit and the lowest point on the understructure of the car sling, exclusive of the safeties, guide brackets or shoes, when the car is resting on the bumpers or buffers fully compressed. (A. S. M. E. Code.) (R. W.)

ELEVATOR HOISTWAY—Any shaftway, hatchway, well hole or vertical opening or space, in which an elevator or dumbwaiter travels. The hoistway may or may not be enclosed. (A. S. M. E. Code.) If all four sides of the hoistway have to be left open for removal of load the counterweight must run in a separate shaft. (R. W.)

ELEVATOR MACHINE—Defined by (A. S. M. E. Code) as the machinery and its equipment used in raising and lowering the elevator car. (R. W.)

ELEVATOR SAFETY GOVERNOR—A flyball governor usually located at the top of the hoistway and acting by centrifugal force to control the elevator speed when it exceeds a certain amount. Two freely revolving flyballs are raised by excessive speed and actuate a cam by means of a link. The latter short circuits a portion of the motor field resistance thereby increasing the field strength and decreasing the motor speed. A further upward motion of the governor balls brings a second cam into action and the latter trips an eccentric operated by two coil springs. The eccentric grips an endless loose cable, which passes the length of the shaftway, and connects with dogs underneath the car, the dogs being set and power shut off by the gripping and moving of the loose cable relative to the car. The dogs can be set in most elevators also by the use of a hand wheel in the car. (R. W.)

ELEVATOR SLACK CABLE SWITCH—A switch ordinarily located at the bottom side of the opening provided for the passage of an elevator hoisting cable from the motor room to the head frame, and actuated by a sagging of the cable in case of any slackness. Also a similar switch placed at the point of attachment of the hoisting cable to the car. (R. W.)

EMBARGO—The Government Order under which ships are detained in port or excluded from a port. Frequently resorted to in time of war, or to prevent undesirable cargoes from being imported from abroad, as in the case of diseased animals. (J. Steph.)

ENFACED PAPER—A term given to the promissory notes of the Indian Government (known in the market as "Rupee Paper") when they bear a notification that the interest upon them can be collected by presenting the notes at the Bank of England. (J. Steph.)

ENGINE—A machine for transforming the potential energy of a fluid under pressure, or containing available heat, into mechanical work either by rotating a shaft, or by exerting a push or pull, or both, alternately, against a resistance. Originally meaning almost any cleverly contrived machine (as engines of war) the term is becoming more and more restricted in its technical usage, with a tendency toward its reservation for prime movers of a definite type. A reciprocating engine is usually meant, if no qualifying term is used. (See Engine, Rotating; Engine, Rotation; Engine, Oscilating; Engine, Reciprocating.) (R. W.)

ENGINE, GAS—An internal combustion engine using as a fuel a gas like natural gas, city gas, producer gas, blast furnace gas, by-product coke oven gas, etc. It may be vertical in small and medium sizes, but large ones are always horizontal. Vertical engines have one cylinder or two or more in a row; horizontal

engines, if more than one cylinder, usually have two cylinders in line, or tandem, and four cylinders in a double or duplex tandem arrangement. (R. W.)

ENGINE, GASOLINE—An internal combustion engine using gasoline as a fuel. Two types are in general use; the automobile type, having two or four vertical single acting cylinders, two stroke or four stroke cycle, usually water cooled by means of a circulating system with pump and radiator, and with jump spark ignition; the stationary type, having a one horizontal single acting cylinder, two stroke or four stroke cycle, water cooled by means of an open water jacket surrounding the cylinder, in which the water vaporizes, with jump spark or make and break ignition. (R. W.)

ENGINE, OSCILLATING—A reciprocating engine in which the cylinder swings on trunnions, the piston rod being directly attached to the crank pin, eliminating the connecting rod. Used in some types of small air motors for hoist operation. (R. W.)

ENGINE, RECIPROCATING—An engine in which a piston moves back and forth in a cylinder, transforming the energy of a fluid under pressure into mechanical work. (R. W.)

ENGINE, ROTARY—An engine generally using steam or air, in which the fluid under pressure is delivered to internal spaces which gradually enlarge to a maximum and then reduce to a small volume, due generally to the eccentric rotation of two of its parts. The fluid is admitted, expanded to the maximum volume and exhausted during the cycle, which may be a half or a whole revolution. All the principal parts of the engine rotate, and there is no reciprocation. (R. W.)

ENGINE, ROTATING—An engine in which the various parts have the same motion relative to each other as in an ordinary reciprocating engine, but in which the crank is made fast and the frame carrying the cylinder rotates and delivers the power to the driven shaft, this being an inversion of the usual arrangement where the cylinder and frame are fixed and the crank shaft revolves. At least three cylinders are used, in order to obtain good balance, and they are usually mounted in a circular frame. These engines are steam, air or internal combustion driven and have certain advantages in the way of smooth running, high speed and light weight. (R. W.)

ENTREPOT—A warehouse used in transshipment trade. The goods remain in the warehouse until their journey is resumed. (J. Steph.)

ENTRY—At port of arrival of a foreign vessel or a vessel of the United States (1) from a foreign port of place; (a) from a domestic port carrying bonded merchandise or foreign merchandise for which entry has not been made at any port or any harbor or bay. The master shall report the arrival of the vessel at the Custom House. (U. S. S. B.)

ENTRY, PRELIMINARY—Master of a vessel required to make entry at the customhouse will make a preliminary entry by making oath to truth of the statement of the vessel's manifest and delivering manifest to the customs officer who boards the vessel. (U. S. S. B.)

ENTRY OF AMERICAN VESSELS—The master of a vessel of the United States arriving in the United States from a foreign port or place, shall within forty-eight hours after its arrival make formal entry of the vessel at the custom house by producing and depositing with the collector, (1) the vessels crew list, (a) is register or document in lieu thereof, (3) the clearance and bills of health, issued to the vessel at the for-

eign port or ports from which it arrived, and (4) the original and one copy of the manifest; and (b) shall make oath (1) that the ownership of the vessel is as indicated, (2) that the manifest was made out in accordance with the provisions, and in addition, shall deposit with the collector the health certificate at the port of entry, certificate of consular services and documents required by vessels carrying passengers. (U. S. S. B.)

ENTRY OF FOREIGN VESSELS—The master of a foreign vessel arriving within the limits of the customs collection district shall within the forty-eight hours thereafter make entry as above for vessels of the United States. (U. S. S. B.)

ESCALATOR—A moving apron type of elevator-conveyor set at an inclination corresponding to that of ordinary stairways, and used for conveying persons or freight up or down. Two types are in use, the cleat, and the step. The former is simply an inclined apron elevator with its surface covered with parallel cleats pointing along the run, and with tops sloped so as to resemble a miniature step. These cleats pass between the prongs of a comb at bottom and top, picking up and discharging the passenger or other load almost automatically.

The step type acts like a moving platform on the horizontal sections at the top and bottom, but breaks into steps as it approaches the slope in a vertical curve. Each step is carried by two rollers at each end, those on the rear side running on rails inside the front ones. On the incline the inside rails are set far enough back of the outer ones to hold the step level. The steps are all connected to chains passing around sprockets at the top and bottom, and the drive is usually at the head.

Escalators may be made reversible; if two are placed side by side, one running up and one down, it is called a **double** arrangement; if the two always run in the same direction, it is termed a **double file** escalator. (R. W.)

EROSION—Where the force of the current, that is, its sedimentary transporting, power is in excess of the load of sediment being carried the current washes out or erodes more material and carries it away; such as scouring out banks, wharf foundations, etc. (R. S. M.)

EROSION, Base Level Of—The lowest level to which a river can erode its bed is called the base level. The sedimentary transporting power is at its maximum or has reached equilibrium. (Shank.)

ESPARTO—A species of grasses found in various countries bordering the Mediterranean, long been used for the manufacture of carpets, baskets, ropes, nets, etc. Chiefly used now in paper-making. Great Britain largely imports from Algiers. (J. Steph.)

EXCAVATOR, TRENCH—An excavating machine designed especially for digging vertical wall trenches for laying lines of piping, sewers, etc. The usual arrangement involves a chain bucket or ladder digging arrangement mounted at the rear of a truck on wheels or a tracklaying truck, a belt conveyor for conveying the dirt from the bucket dumping point at the top of the ladder to the spoil bank at the side, and a boiler and engine for driving the machinery and moving the whole excavator slowly along the trench. The ladder usually slopes downward to the rear, the buckets scrape the dirt off the end of the cut on the way up, and dump as they pass over the top sprockets which also does the driving. Side cutters are attached directly to the chains. The width of the trench may be altered by changing the buckets

for others of a different length and the machine cuts the full width and depth (which can be varied)—at one cut. The ladder may be swung up horizontally when the excavator is to be moved to a new location. It begins the trench by digging as it is swung down. The belt conveyor can be arranged to deliver the spoil to either side and to any height within the capacity of the machine. (R. W.)

EXPANSION JOINT—A joint or connection which permits expansion due to heat or other causes. In piping expansion joints are of the **sliding** or **telescoping** type, of the **flexible bend** type, or of the **corrugated cylinder** or **diaphragm type**. Expansion in rails is allowed for by leaving open spaces between the rail ends, though less attention is paid to this than formerly, and the rails are even welded together continuously for long sections. Buildings, bridges, concrete structures, pavements, long crane runways, etc., are provided with means of taking care of expansion. (R. W.)

EYE—A hole through a pin, bolt, etc., or a metal piece or rope looped so as to form an opening through which something can pass, as a hook or rope. (R. W.)

EYE BAR—A long bar having an eye in each end, like the tension members of some bridge structures. (R. W.)

F

FACTOR OF SAFETY—A quantity which, if multiplied by the working stress in a part under load, will give a quantity equivalent to the ultimate strength of the material of the part. This is the nominal or so-called apparent factor of safety, and to say that a factor of safety is four does not mean that the part can be subjected to four times the working load before rupture. The real factor of safety, involves allowances for the following: The kind of loading as steady or dead, variably or reversing; the elastic limit of the material; the method of applying the load—gradually, suddenly, or with shock; and for ignorance as to the internal condition of the material—its defects, etc. In any material having an elastic limit, the actual factor of safety will be less than the nominal in proportion to the ratio of the elastic limit to the ultimate strength. (R. W.)

FAIR CAIRN JIB CRANE—See Crane, Girder Frame Jib.

FAIRLEADS—Fittings used to guide rope or chain so that it is delivered “fairly” or in the plane of the receiving sheave or drum. They may be drums, guide sheaves, or rollers, or merely smooth eyes or guides over which the rope or chain can slide easily. (R. W.)

FAIR-LEADER—A guide or guard for loading rope or chain properly onto a sheave or drum, usually consisting of a smooth rounded opening in a metal plate. Where much wear is expected it is renewable. Another type often used with grab buckets consists of a guide sheave, with two rollers located on opposite sides of the rope close to the point of contact with the sheave. A third roller is placed across the plane of the sheave, thus completely enclosing the rope in four rolling surfaces so that it cannot chafe. Two sheaves and two rollers, with their axis at right angles, are also used. Also called a **four-way rope guard**. (R. W.)

FALL—A rope used in handling the draft.

Burton or burton fall—In discharging the fall which carries the draft athwart ships and lowers the draft onto the wharf.

- Up-and-down fall**—The fall which raises and lowers the draft in the hatch opening.
- Midship fall**—The up-and-down fall.
- Rapid transit fall**—The third fall used in the method of discharging called the "rapid transit" to give greater speed to the burton movement.
- Extra fall**—The rapid transit fall, also called the trolley fall.
- Hurry up**—The rapid transit fall. (Br. R. S. M.)
- FATHOM**—A nautical measure equal to six feet, used in measuring depth of water at sea—harbor depths being measured in feet—and in measuring anchor chains and also sounding lead ropes or lines. (R. S. M.)
- FERRULE**—A short cylindrical tube fitted on the end of another tube or cylinder of steel, wood, etc., to reinforce it to or prevent undue wear. Ferrules are often combined with caps or discs covering the ends of the part in question, and occasionally have an axially or radially projecting flange. A good example of the latter is in the type of roller conveyors for handling brick. (R. W.)
- FINAL DIAMETER**—(Of a ship when turning) is the diameter of the circular path which the ship traverses if the helm is kept over. When the path becomes a circle it can be measured between any two opposite points. The *Mauretania* possesses a diameter of turning circle of 950 yards or about 3.7x her length, steaming 23 knots. (Shank.)
- FINES**—The name given to the finer material in screening operations, especially to the smallest of the material which passes through a given mesh or perforation mixed with other sizes up to the maximum allowed by the openings of the screen. (R. W.)
- FISH-BELLIED**—The term applied to a beam when the depth is decreased toward the ends in order to approximate a beam of uniform strength. The top of the beam is usually straight and horizontal, the lower outline curves upward toward the ends, the shape being approximately that of a parabola with the axis vertical. (R. W.)
- FLANGE**—(1) The turned edge of a rolled structural shape. (2) A circular plate with thickened hub around a hole in the center, used for coupling pipes or shafts. (3) Also the flat rim around an opening in a casting, for attaching another part or a cover, as a cylinder flange. (R. W.)
- FLEET**—A term applied to the passing of a rope through a machine or around a sheave, as opposed to fastening or dead-ending it. A rope fleets through a grab bucket when the latter is suspended in the bight of the rope, it is dead-ended in it when it is made fast to some part of the bucket. (R. W.)
- FLIGHT**—(1) The part of a flight conveyor which comes in contact with the material or package conveyed, moving it by reason of its connection with the conveyor, chains or cable. (2) Also, the helical portion of a screw as used in a screw conveyor, comprising one complete turn. (3) Also, a succession of steps on which persons may ascend or descend, as a flight of stairs. (R. W.).
- FLOAT**—A floating platform or shallow scow-shaped boat with a deck, used as a landing platform. Also, such a craft used around shipping for miscellaneous work purposes, such as painting. (See also Float, Car.) (See also earfloat.) (R. W.)
- FLOATAGE**—The operation of moving railroad cars on a earfloat. (R. S. M.)

FLOATATION, LOSS OF—A ship navigated in shallow water loses buoyancy due to a limited water area, it suffers a loss of water support due to the limitation of the channel. The passage of a ship through a narrow canal lowers the water level and lowering her keel 40 to 50 centimeters at 10 kilometers speed, and 93 centimeters at 15 kilometers speed. (Shank. R. S. M.)

FLOATING BRIDGE—See Bridge.

FLOW DIAGRAM—A diagrammatic representation of the paths taken by a material and its various sub-divisions as it passes through a plant in which continuous operations are performed on it. Flow diagrams are often made out for crushing, screening and washing plants, cement plants, brick plants, etc. (R. W.)

FOG SIGNAL—See Diaphone.

FOOT BLOCK—The platform or passageway arranged to allow the passage of people walking. In overhead crane structures footways are placed where needed on the bridge to provide accessibility of the machinery. Footways are also often arranged along conveyor runways which would otherwise be inaccessible, as on bridges over yards or streets, or in tunnels. In some types of overhead crane having load ropes both inside and outside the bridge girders, footways on the bridge are impossible, and access to the bridge for care and repairs is had by running it to a permanent platform built at one end of the runway. (R. W.)

FORE AND AFTERS—The transoms of the hatchway running fore and aft. (Br.)

Also termed strong backs. (R. S. M.)

FRESH WATER—Supplied to vessels by Ship Chandlers, from wharf pipe lines or tank barges, at — cts per 1000 gals. Some wharves or ports render this service at cost as an inducement. Rates vary from 50c to \$2.00 per 1000 gallons—or 35c to 75c per short ton—barged. (Charleston prices.) (R. S. M.)

FRICTION GEAR—Any gear which runs loose on its shaft, but which may be made to turn with it by a friction clutch connecting the two when properly engaged. One part of the clutch is carried by the gear, and the other by a hub keyed to the shaft. (R. W.)

FROG, MONORAIL—A cast or forged piece connecting two monorail runways to a third in such a way that the trolley may be run from either of the two onto the third, or reverse. A steering device must be used on approaching the frog on the single runway to force the trolley to run as desired. (See also Switch, Monorail.) (R. W.)

FRUIT BOX—A wooden box attached to the fall in which small boxes or packages are placed for loading and discharging. It is sometimes called an "ambulance" because it is used to take injured men ashore. (Br.)

FUMIGATION—The disinfecting of ships by filling them with hydrogen-cyanide or prussiac acid gas. This fumigation is primarily to extinguish rats, mice, insects, lice, fleas, bugs, etc. It does not disinfect the plague bacillus but kills the rats that are the carriers. (Shank. R. S. M.)

FUMIGATION CHARGES—The fee charged by the U. S. Public Health Service to fumigate a vessel. (R. S. M.)

G

GAFF—The name given to a horizontal spar lashed to a mast and used as a crane—mast and gaff. (Br.)

GAGE—A standard of measure; an instrument for measuring height, pressure, form, dimensions, etc., as pressure gage, water level gage, wire gage, plug and ring gage, thread gage, track gage. (R. W.)

GAGE, TRACK—The distance between the inside of the rail heads of a railroad. The standard gage is 4 ft. 8½ in. Narrow gages vary from 2 ft. 6 in. to 3 ft. 6 in., 3 ft. 0 in. being common, also 1 meter gage in Europe. Broad gages are used for special machines, travelling cranes, transfer tables, etc. (R. W.)

GANTRY—A structure that spans, bridges or hanks over—to gant means to hang over. (R. S. M.)

GANTRY, CANTILEVER—A gantry in which the bridge is continued into an overhanging portion beyond the A-frame support on one end (single cantilever) or on both ends (double cantilever). The cantilever ends may be short as compared with the span of the bridge, or may be very long in which case it is sometimes called a shipyard gantry, from its usefulness in ship construction. The cantilever ends are often unequal in length. The end frames must be open if the load picked up on the cantilever ends are to be run inside; to secure the necessary stiffness, the two sides of the A-frame are then run up and tied together at the top, high enough to clear the trolley. In many cases the range of trolley travel is entirely outside the supports, which are then relatively close together and are braced to each other, giving a tower with a gantry base.

In some shipyards where side launching is practiced, the gantry cranes run on three lines of supports ordinarily, removed during the launching period, and the span is thus temporarily converted into a cantilever. (R. W.)

GANTRY, CANTILEVER BRIDGE—(See also Gantry, Cantilever.) A term sometimes applied to a cantilever gantry crane, especially one in which the bridge span and cantilevers are very long, and are of trussed construction like ordinary bridges. They are used where very large areas must be served, but where the customary load is comparatively light, as in coal and ore handling and storage. (Also called Ore Bridge. See also Crane Bridge Storage.) (R. W.)

GANTRY, FIXED—A gantry which is fixed in location. When supplied with a trolley on the bridge and a hoist, it is often called a transfer crane, and is much used for transferring loads between cars and trucks in freight yards. (Also called Transfer Gantry, Railroad Crane.) (R. W.)

GANTRY, FLOATING—A double cantilever gantry crane of large capacity and high lift, installed on a barge or pontoon. The gantry bridge is supported on four or more braced legs along the sides of the pontoon, and the cantilever extensions at the two opposite ends allow a load to be raised from a dock or ship, moved inward, and deposited on the deck of the barge. The operation is reversed to lower a heavy weight into a ship. The free deck of this type of floating crane is a great advantage for storage purposes, but owing to the limitation of the trolley to straight line motion only, the crane must be warped along the side of the vessel or dock to properly locate the load, and this is often a disadvantage. (See also Crane, Floating.) (R. W.)

GANTRY, FOLDING JIB—A travelling cantilever gantry with one (or both) of its cantilevers hinged close to the inner end so that it may be raised into a vertical position and leave the space alongside the crane absolutely clear. This enables the crane to be run past an existing structure, which would otherwise block it, or, if used alongside a dock as a cargo or fitting-out crane, allows the ship to be warped into position without the interference that would exist between the fixed cantilever arm and the stacks or rigging of the vessel. (R. W.)

GANTRY, FULL OR FULL PORTAL—An ordinary travelling gantry with two legs of equal length, so called to distinguish it from a semi-portal gantry. (See Gantry.) (R. W.)

GANTRY, ROTARY JIB—A gantry crane carrying a jib which may be rotated about a vertical axis. The jib, which is fixed in inclination, and is generally horizontal, may or may not carry a trolley. In some cases the turntable on which the jib is mounted is itself on a carriage travelling on rails along the gantry bridge. (R. W.)

GANTRY, ROTARY TOWER—A tower gantry in which the load-carrying element may be rotated about the vertical. (See Gantry, Tower.) (R. W.)

GANTRY, SEMI-PORTAL—If one of the two runways of a travelling gantry is elevated close to the bridge, so that the usual A-frame support on that end is missing, it is called semi-portal, single A, one leg, half arch or half gantry. This construction is generally advantageous when a building wall or other existing structure can be utilized at one end to support the elevated runway, as it saves much space on a wharf apron. Various forms of handling gear are used on semi-portal gantries, the most usual being the ordinary rotary pillar crane with geared drum winch, either fixed in position on the bridge, or on a wheeled trolley, the latter being the more common. (R. W.)

GANTRY, SHIPYARD—(See Crane, Shipyard.) Cantilever Gantries in shipyards generally travel on elevated runways; tower gantries on widely spaced rails on the ground. (R. W.)

GANTRY, TOWER—A crane which is mounted on a towerlike structure with a gantry base, the tower being used in order to obtain a high lift, and the gantry base in order to allow a track to pass beneath it to bring material to it. (R. W.)

GANTRY, TRAVELLING—A gantry which is capable of self-propulsion along rails. To allow for inequalities of the track, a three-point support of the bridge is sometimes used, and a pivot connection between the bridge and one of the supporting towers prevents distortion in case one end of the bridge gets ahead of the other. (See also Gantry.) (R. W.)

GANTRY, ROTARY BRIDGE—A gantry crane in which one leg is fixed in a position or pivoted so as to rotate about a vertical axis, while the other leg travels on a rail at the circumference of a circle of which the length of the bridge is the radius. A trolley on the bridge enables any part of the circle to be reached. Used for storage work. (R. W.)

GANTRY BASE—A base formed like a gantry or with a cross structure supported by legs or frames at the ends. This term is used in connection with elevated or tower travelling cranes, etc., in which the structure usually spans tracks on which cars are used to transport the material to the crane. (R. W.)

- GASKET**—A ring or sheet of packing material by which a flanged or faced joint is made water, steam, air or oil tight. The materials used are rubber, canvass, asbestos, paper, white lead, copper, etc. (R. W.)
- GATE, CONCRETE**—A gate used for controlling the flow of concrete from hoppers, spouts, etc. Both the sliding and quadrant forms are used, with the especial requirement that they should be grout-tight. (R. W.)
- GATE, CLAM-SHELL**—A duplex quadrant gate. (See Gate Quadrant.) (R. W.)
- GATE, CONVEYOR TROUGH**—A gate for controlling the discharge from the bottom of a trough in which a screw or a drag conveyor operates. The most common form is a plain flat sliding gate, moving transversely or longitudinally with respect to the trough, in guides formed in a casting bolted to the bottom of the trough and operated by a hand lever or some form of gearing. If it is important to have the cylindrical form of the bottom of a screw conveyor trough maintained throughout, the gate may be curved to fit it, and slid longitudinally. (R. W.)
- GATE, FLAP**—A swinging gate located between two bottom openings in a two-way hopper, to allow the discharge to be directed through either at pleasure. Flap gates are similarly used at Y-branches in spouts, and at discharge openings in the bottom of chutes. (R. W.)
- GATE, QUADRANT; CYLINDRICAL**—A gate used for controlling the flow of loose material in a chute or spout, or the discharge from a hopper or bin, and consisting of a hollow partial cylindrical portion which cuts into the material edgewise along the diameter and forms the gate proper (also called **leaf** or **spade**.) This is supported by circular sectors cast with it at each end and mounted on pivot or on a through shaft which is generally located at the center of cylinder curvature. For flow in inclined chutes, the quadrant gate may be so placed that when closed, it will hold back the material in contact with the inside or with the outside of the cylindrical portion. It may also be arranged to cut downward into the stream of material, called an **over-cut gate**, or may come up from beneath the stream, called an **undercut gate**. (R. W.)
- GATE, RACK AND PINION**—A sliding gate which is operated by turning a handwheel on a shaft with one or two pinions which engage with a corresponding number of racks attached to the gate or to an extension of the gate. (R. W.)
- GATE SLIDING**—A form of gate in which a flat plate (sometimes braced or ribbed for stiffness) slides edgewise in guides to control the flow of fluids in a channel, by reducing or cutting off the area for flow. Such gates may be easily made water tight, and are much used for handling water flowing in channels for hydraulic power purposes. They are also used for controlling loose bulk material flowing from bins, hoppers or storage pockets, or from the troughs of screw, flight and drag conveyors. (R. W.)
- GATES, STORM**—Of Docks pointing in the opposite direction than for impounding water in lock or dock. They are constructed to withstand periodical floods or unusually high tides. (Br. Cun.) R. S. M.)
- GATES WITH TWO LEAVES**—Usual method of closing a dock, with two semetrical gates or leaves, each a little longer than half the total width of the dock entrance, meeting when closed on the center line in such a way as to afford each other mutual

support by pointing against the pressure of the impounded water. (R. S. M., Br. Cun.)

GATE VALVE—A form of valve fitted in a pipe for conveying fluids, in which the opening is closed by the edgewise sliding of a part called **the gate**, moving in guides cast in the valve body. The gate proper is opened or closed by a stem passing out of the valve through a stuffing-box; the stem may be smooth, and operated by direct push or pull exerted by a lever, or it may be threaded through a nut, and operated by a hand wheel. (R. W.)

GATTIE SYSTEM—A system that has been proposed as a substitute for the numerous scattered and badly congested freight stations in London, comprising a combination of a large central terminal clearing house for incoming and outgoing freight, with a demountable body system for holding the freight, these bodies being transferred from motor truck to clearing house, clearing house to railway car, or car to car, as required. (R. W.)

GAUNTREE—Obsolete spelling of gantry. (R. W.)

GEAR—A comprehensive term including all the equipment involved in performing a certain operation, as Hoisting Gear, Coaling Gear, Cargo Handling Gear. (R. W.)

GEARING—A mechanism used for transmitting motion from one rotating part, such as a shaft, to another similar part, by means of the rolling of a surface of cylindrical, conical or other more complicated form, attached to the first shaft, upon another surface mounted on the second shaft. The rolling surface may be actual, as in friction gearing, or imaginary, or replaced by intermeshing teeth and spaces formed on bodies attached to each of the shafts, and shaped so as to produce a motion equivalent to that given by the rolling surfaces; the latter is termed toothed gearing. The teeth of gearing are said to **mesh** with each other (R. W.)

GEARING, BEVEL—A form of gearing used to connect shafts whose center lines intersect, consisting of truncated cones in contact along a common element and with their apexes located at the point or intersection of the shaft center lines. The most common case is where the shafts are at right angles. If the two gears are equal, they are called **miter gears**. If the shafts are not at right angles they are often called **angle gears** and if unequal, **angle reduction gears**. (R. W.)

GEARING, FRICTION—Gearing in which motion is transmitted from one rotating part to another by means of the friction generated by pressing one against the other. For this service it is natural to choose materials which have a high coefficient of rubbing friction. These include paper, fibre, rubber, leather, wood, etc. One of the two parts, preferable the driven one, is made of cast iron, as it will not be so easily grooved if stalled by excessive load while the driving part continues to rotate against it. (R. W.)

GEARING, HELICAL—A type of toothed gearing used for connecting two shafts which do not intersect, and which have teeth that are helical in form, or twisted, relative to the elements of the pitch surface. They may be of the bevel form, but are ordinarily cylindrical. The shafts may be parallel, at right angles, or at any intermediate center angle; in the first case, the action is much like that of ordinary spur gears, except that it is smoother. The ratios of the shaft speeds may be equal or unequal; the special case of the shafts at right angles and with a very large speed ratio, is generally termed worm gearing. (See Gearing, Worm.)

GEARING, SPUR—The common form of gearing, used for connecting parallel shafts, and having teeth formed on the circumference of short cylinders rolling in contact with each other. It is the simplest form, can be made high in efficiency, and is widely used in hoisting machinery. (R. W.)

GEARING, TRAIN OF—A combination of gears on several shafts, all meshing and having a definite relation between the speed of the driving and that of the driven gear, is usually termed a train. (R. W.)

GEARING, WORM—A variety of helical gearing in which the non-intersecting shafts are at right angles and the angular velocity ratio is very large, resulting in one of the wheels having very few teeth, usually from one to four, and resembling a screw with as many threads, and the other wheel having a considerable number of teeth cut at a slight angle. The velocity ratio, or speed reduction, is equal to the ratio of the number of teeth on the wheel to the threads on the worm. The lead of the worm is the linear distance through which it turns the circumference of the wheel when the worm makes one complete rotation; its pitch is the distance from one worm tooth to the next, and is equal to the lead only when the worm is single-threaded. As the wear is heaviest on the worm, it is usually made of steel and the wheel of cast iron or bronze. Both are mounted in a case or housing containing a supply of lubricant, and provided with bearings for the shafts so that the worm and wheel will be held in the proper relative location, and with a thrust bearing to receive the end thrust of the worm. Elevator machine is a common example. (R. W.)

GEARS, INTERLOCKED—In hoisting machinery when two drums driven by separate motors are used to lift the same load by load lines attached to it at different points, the gearing must be interconnected in such a way as to prevent unequal raising or lowering, and consequent tipping; this is called interlocking gearing. (See Crane, Ladle.) (R. W.)

GIRDER, BRACED—A structural steel beam made up of plates and shapes, with continuous members running for the whole span along the top and bottom, these being connected at the ends, and at frequent intervals between, by diagonal or vertical struts or bars, or by both diagonals and verticals. The continuous members are made up of channels, angles or strips of plate, single, in duplicate, or combination with each other; the upper member is called the top chord or (in beams supported at the ends) compression flange, the lower is called the lower chord or tension flange. The upper chord is horizontal, the lower horizontal or fishbellied, the latter being more costly, but lighter. A number of systems of bracing are used, the most usual for cranes being the Warren, Linville and Lattice:

Braced construction is lighter than the plate or box girder type, but the labor cost to manufacture is higher. Weight saved in a crane bridge may, however, allow a saving in the runway girders.

Braced girders are used in all bridge structures of large span and for supporting heavy loads, and for small spans and lighter loads where weights are important and the headroom is not restricted. (R. W.)

GIRDER, DUPLEX—A double-braced girder consisting of two simple braced girders placed side by side but separated a small distance, and latticed together. This construction gives greater trans-

verse strength and stiffness than would be given by a plain braced girder of equal vertical strength.

It is much used in girders of bridge cranes. (R. W.)

GIRDER, PLATE—A structural steel beam made up of plate and angles arranged so that a transverse section of the beam is like the letter I. This gives a beam of great vertical strength unless reinforced by a horizontal auxiliary girder, or braced to another duplicate girder. (See Girder, Box.)

Used for runways and bridges of overhead travelling cranes and in steel construction work generally. (R. W.)

GIRT—The distance piece or separator which holds the two side frames of a crane trolley in their proper position. It supports the operating machinery and also carries the upper block of the hoisting tackle and the equalizing sheave. The heavy load may cause deflection of a single girt with the resulting binding of bearings, so an extra girt is often supplied, called the **load girt**, which is attached at the ends to the side frames at points directly over the rails in such a way that its deflection cannot cause springing of the side frames. This girt carries the upper block; the usual girt, called the **machinery girt**, support the machinery—motors, brakes, etc. The load girt carries from one-half (in four-part reeving) to seven eighths (in sixteen-part reeving) in large cranes) of the total load, the remainder being divided between the equalizing sheave and the drum. Occasionally two machinery girts and one load girt are used. Sometimes called lifting beam. (R. W.)

GOLIATH—A popular name given to a type of large travelling gantry crane used for shipyard fitting out. (R. W.)

GOOSENECK—(1) An iron fitting sometimes used for attaching the inner end of a derrick boom to the mast. A bar or pin is hinged to a piece rigidly attached to the end of the boom and this pin fits into a vertical socket in a part attached rigidly to the mast, thus permitting both change of inclination and slewing of the boom.

(2) Also, a piece of pipe shaped like the letter S, or one with a return bend on the end. (R. W.)

(3) A crane boom, lattice type usually bent forward at the end of the third quarter mark, to give greater outboard reach. (R. S. M.)

GRAPPLE—A device operating like a clamshell grab bucket, but having three or more prongs on each side instead of shells made of plate, and used for handling long objects either singly or in bulk, like logs, ties, pulpwood, etc., and for handling irregular objects like stumps, snags and large stones. For long objects the sides are usually open to allow the ends of the pieces to project, but for stone, etc., they may be closed by short prongs. (R. W.)

GREASY WOOL—The wool or fleece of sheep when shorn and still unscoured. The majority of the Australian and Cape wool comes in a greasy condition. Considerable judgment has to be exercised by wool buyers, as the quantity of dirt in a particular consignment varies considerable, and an error of even 1% in estimation the yield of wool would result in a bad bargain. (J. Steph.)

GRIBBLE—See Limnoria Lignorum Rathke.

GROUND TACKLE—Anchor and Chains. Formerly 120 fathoms chain for each bower anchor was usual. Ground tackle now classified on a ton-measurement bases—Lloyd's Register begins with a minimum of 11-16 inches and 60 fathoms for each bower

anchor. The maximum, is 3 and 8-16 inches and 330 fathoms of chain or 165 fathoms for each bower, for vessels of the Leviathan, Majestic class. (Shank. R. S. M.)

GUDGEON—(British)—An overhung or cantilever pin or shaft, like the crank pin of a side crank engine.

In particular, the term often applied to the pivot pin at the top of a derrick mast. (R. W.)

GUNNY BAGS—Sacks woven from the coarse fibre of the jute plant. The bags and sacking are largely exported from India to the United States, Australia, and Straits Settlements. The trade has developed considerably in recent years: the bags are mainly used for wool-packs, sacks for grain, seed, and salt. (J. Steph.)

GUSSET PLATE—A bracket of steel plate for stiffening the connection between two structural steel members meeting each other at an angle. In overhead travelling cranes, strong gusset plates are used to stiffen the connection between the bridge girders and the end truck. (R. W.)

GUY—A rope or other similar appliance used to steady something. A rope or chain used to steady a boom, mast, etc., and keep it from falling over or from swinging sideways. (See Guy, Derrick.) (R. W.)

GUY—(Verb)—To make fast or steady, e. g., to guy the booms. (Br.)

GUY CAP—A circular metal part to which the guys supporting a derrick mast are attached. It fits on the gudgeon or mast top pivot as a bearing, and has openings around its periphery through which the ends of the guys may be passed, bent around on themselves and secured by clips. (See Mast Top.) Also called Guy Spider. (R. W.)

H

HACK—A name applied to a kind of pallet used for holding a pile of brick during the process of manufacture, consisting of a solid or slat stop with two cross cleats beneath. (R. W.)

HAGUE RULES—A codification of varied provisions of the York Antwerp Rules and others brought forward by Mr. Hague.

HANDBARROW—A rectangular flat bottom box, with the long sides extended at each end to make handles by which it may be lifted or carried. (R. W.)

HANDLEATHER—A piece of leather fastened at the wrist and worn by winch men. (Br.)

HAND-LINE—A small manila or hemp rope of convenient size to be coiled and one end being held, thrown to a distant point, generally as a means of hauling a larger rope, chain, etc., across an open space. Also, a small line used for lowering or hoisting articles by hand. (R. W.)

HAND OF BANANAS—A layer or growth of bananas around the stem. The term is used in the banana trade to designate the size of the bunch, so many hands. (R. S. M.)

HANGAR—A building to shelter aeroplanes or dirigibles. (R. S. M.)

HANGER—A platform or shelf on which bananas are tossed during the process of unloading. (Br.)

HATCH—An opening in the vessel from the hold up. An all-over hatch is carried through all the decks; a blind hatch is not. (Br.)

HAWSER—A large rope, either manila or wire, used on shipboard for towing, mooring, etc. (R. W.)

HEADROOM—The distance underneath a structure or obstruction, or between it and the ground. Clearance measured in a vertical direction. (R. W.)

HEALTH DUES—Fees paid to the Public Health Service for health inspection, fumigation and similar services.

Fees paid a port physician for medical inspection, council and minor medical service. This is a contractual arrangement between the agent or owner and "port doctor." (R. S. M.)

HEEL—The inclination to one side of a floating vessel. Also the lower or inner end of a spar, boom or strut. (See Boom Heel.) (R. W.)

HELIX—A curve traced by a point which moves around a fixed line at a constant distance from it, and at the same time progresses along the line, like the thread on a bolt. (R. W.)

HENNEBIQUE SYSTEM—Of reenforced concrete slabs differing from the Monier system in that the bars of the network are larger, spaced farther and set obliquely. (R. S. M. Br. Cun.)

HITCH—Any one of a variety of methods of attaching a rope to an object, to another rope or to another portion of itself, in such a manner that it can be easily detached. (R. W.)

HOIST—A mechanism or machine whose function it is to elevate or raise heavy objects, generally by means of tackle or gear hanging from above, and often including such tackle or gear. The load usually hangs free; when a guided platform carries it the term elevator is used (see elevator), but this rule has exceptions (see Hoist, Mine.) The mechanism is usually arranged to give a reduction of speed and increase of force between the source of power and the point of lifting, but this may be reversed, as in **air cylinder hoists**. Most true hoists are self-contained or complete in themselves, as **chain hoists**, **pneumatic hoists**, **block-and-tackle**, and some electric hoists; other so-called hoists are simply winding machines requiring combination with other machines and fittings before hoisting can be accomplished. The term is frequently incorrectly used to designate a winch or any geared machine which can exert a pull by winding rope on a drum. This is correct only in case it is mounted in an elevated position relative to the load, or with the load pendent from it. When it is located on the ground and used for hoisting purposes by leading the rope to an elevated sheave, it is better called a **hoisting winch**.

The different kinds of hoists are distinguished by terms designating (a) the power used, as for example, hand, electric, air; (b) the kind of gearing used, as chain, other apparatus as trolley, twin, built-in, independent. The hoists of most overhead travelling cranes and of many gantry and jib cranes are built into the trolley. (R. W.)

HOIST, EPICYCLIC—See Hoist, Planetary. (R. W.)

HOIST, PLANETARY GEARED—A hoist in which a train of planetary or epicyclic spur gearing is used to obtain a large velocity ratio between the points of application of power or hand pull, and of the load. Such hoists are made for both hand and power drive, the latter usually being by an electric motor. The gearing is arranged in various manner; two examples will be given. In one a hand chain passing over a chain sheave rotates a pinion. Equally spaced around the circumference of this pinion, meshing with it and carried in a frame which can rotate independently of the shaft mentioned, are two or three intermediate gears each having fast to its side and concentric with it a smaller gear which meshes with an annular gear fast to the casing. The frame carrying these intermediate gears is rigidly connected to a sleeve surrounding the shaft of the hand chain sheave, and fast on this sleeve is the load sheave, over which the load

chain is passed. Rotation of the hand chain shaft pinion forces the intermediate gears to turn, and on account of these meshing with the annular gear they are forced to roll around inside it, carrying with them the frame and the load sheave. A large angular velocity ratio of the hand to load shafts can be obtained with very few shafts and gears; consequently the efficiency is high, and a load brake must be included to prevent involuntary lowering. (See Brake, Load.) This is sometimes called a **triplex hoist**.

In another hoist, also hand operated, the turning of the hand chain wheel rotates a pair of small eccentrics through a spur gear and two pinions. These rotate in circular openings in a frame on which is mounted an annular gear, giving it a gyratory motion, or a motion of circular translation. The annular gear is always in mesh with a spur gear to the shaft of which the load sheave is fastened, and each gyration of the annular gear causes the gear to rotate by an amount equal to the difference in the numbers of teeth in the annular and gear. (R. W.)

HOIST, PORTABLE—A hoist which may be moved from place to place and be hung on a support for lifting operations, as distinguished from one which is built into a crane or other structure. (R. W.)

HOIST, TWIN—An arrangement of two hoists on one trolley which can be simultaneously operated to lift long objects. The arrangement can be applied to bridge crane trolleys, or to monorail trolleys having two trucks connected by swivels to a single frame. (Also called Dual Hoist.) (R. W.)

HOLD-HOOK—A name sometimes applied to a hook attached to the bottom of a crane trolley, to which a load can be transferred from the lifting hook when desired. It is a regular part of the equipment for some types of single-rope grab buckets, for holding the bucket while it is being opened by slackening the closing line. (R. W.)

HOLDING GROUND—The nature of the bottom with respect to the firmness with which the anchor lays hold of the ground to hold the vessel in one place and not drag its anchor. (R. S. M.)

HOOK—Slang for anchor, i. e., "drop the hook", to anchor. (R. S. M.)

HOOK, THE—A forged steel hook at the end of a hoisting rope, (fall, whip) to engage the rove of the draft. (R. S. M.)

HOOK, SAFETY—A hook having a piece hinged to swing down and lock over the point and prevent the slings from slipping off. This piece may also be locked in the open position. (R. W.)

HOOK, SPLIT GIRDER—A hook specially designed for lifting steel girders having stiffeners. It consists of two hooks with split points, having an iron ring passing through their eyes. The split points set over the stiffeners on opposite sides of the girder. (R. W.)

HOOK, SWIVELING—A hook arranged with a shank which can turn in a bearing, the load being carried on a plain collar formed on the shank, or by ball or roller bearings interposed between the collar and the yoke. (R. W.)

HOOK, TRIP—A type of hook used where it is necessary to drop the load suddenly as in breaking castings, etc. The lower part of the hook is hinged to the standing part or shank and is held by a trigger or catch which can be released by pulling a cord, allowing the hook to tip forward. (R. W.)

HOOKS, SISTER—Two hooks, with points turned toward each other, on the same shackle or ring. They virtually form an eye, though the sling does not have to be reeved through them. (R. W.)

- HOPPER**—A temporary container for bulk material shaped like a funnel, but with four flat tapering sides arranged like an inverted truncated pyramid, with the large end up and generally open, and the small end down and generally closed by a gate or valve. Hoppers serve for solids in bulk the same purpose that funnels do for liquids, that of receiving intermittently a large flow or a flow of large cross sectional area, and delivering it through an outlet in a much smaller stream, continuously if desired, and in any case controlled by a gate or valve. Hoppers are built of steel plates, wood and concrete, the latter being more common where the structure is beneath or close to the ground level. (See Hopper, Track.) The sides are usually sloped sufficiently to allow complete discharge of the contained material. (R. W.)
- HOPPER, GRIZZLY**—A bar grating or screen across a hopper opening which is set level with a floor for receiving the sand dumped from foundry flasks, etc. (R. W.)
- HORSEPOWER**—A commonly used unit of mechanical power, representing the rate of expenditure of energy required to do 33,000 foot-pounds of mechanical work per minute. (R. W.)
- HYDROGEN, CYANIDE**—Agent used in ship fumigation. (R. S. M.)

I

- I-BEAM**—A rolled steel bar having a cross-section shaped like the letter I. The size is designated by the height of the I; for each height there is a standard width of flange, and also several different thicknesses. The weight is specified in pounds per running foot. (R. W.)
- IDLER**—A sheave or pulley which runs free, without transmitting power, and merely serves to guide or support rope or chain. Movable idlers are also used as tighteners for rope and belt drives, and are especially valuable in giving a large arc of contact where it would otherwise be small, due to the short distance between centers. (R. W.)
- IMPROLODED**—Bursting inwards from outside pressure. (Shank. R. S. M.)
- INDICATOR**—An instrument used for determining the power developed by a reciprocating engine. Also, any mechanism which shows or indicates the position, condition, quantity or quality of something, as a depth, speed, pressure of polarity indicator. (R. W.)
- INDICATOR, DEPTH**—A device attached to a mine or other hoist by which the operator can observe the vertical location of the car in the shaft. (R. W.)
- INERTIA**—That property of matter by which it tends to remain at rest if originally at rest, or to continue to move at uniform velocity in a straight line if originally in motion. It requires more power to start material to moving than to continue its motion after it is started, and greater stresses are developed in machines at the time of sudden starting and stopping than occur when they are operating uniformly. As examples, the bridge of an overhead traveling crane is subject to heavy side stresses due to inertia when travelling on the runway if suddenly started or stopped, and the boom of a locomotive crane receives similar excessive stresses when slewing is started or stopped suddenly. (R. W.)
- INERTIA, MOMENT OF**—The moment of inertia of an area with respect to a given axis is the limit of the summation of the products of the elementary areas into which the area may be

considered as divided by the square of the distance of the elementary areas from the axis.

There are several moments of area of a section, according to the location of the axis, and these appear in calculations of the strength of beams, trusses, cantilevers, shafts, etc., including practically all machine and structure parts. (R. W.)

INERTIA, MOMENT OF—Of a ship when turning about a vertical axis through the centre of gravity depends upon the longitudinal distribution of weights, being found by multiplying each weight in the ship by the square of the horizontal distance from the axis and adding the products. (Shank.)

J

JACK—A compact self-contained portable mechanism for lifting or otherwise moving very heavy loads through small distances by the application of hand power. In addition to producing bodily motion, jacks are used for forcing tightly fitted parts apart or together. The larger the load lifted, the smaller the speed of lifting and in general, the heavier the jack.

According to the type of mechanism they are termed **screw jacks**, **lever jacks**, **air jacks** and **hydraulic jacks**. (R. W.)

JACK, HYDRAULIC—A form of jack in which the load to be lifted rests on a plunger fitting in a cylinder, and a hand pump delivers a liquid from a reservoir in the head into the space beneath the plunger, thus forcing it and the load, upward. They are made in various types, and capacities up to several hundred tons. (R. W.)

JACK, SCREW—A jack in which a screw receives a torque from an outside source of power, generally hand, and transforms a portion of that torque into thrust or translation which is applied to the object to be moved. The screw revolves through a nut fixed in the jack base, or, in some cases, the screw rises without turning while the nut is rotated by hand power. The range is limited by the length of the screw. (R. W.)

JACK-KNIFING—In a derrick, the term applied to the involuntary and undesirable raising of the boom sometimes occurring when a heavy load is being lifted. It is due principally to having the load line led from the boom point to a sheave well upon the mast instead of near its foot. The load line pull is thus tending to raise the boom, and if the block and tackle purchase is such that the load would descend with this raising of the boom, it may occur involuntarily at certain angles of the latter. (R. W.)

JASON CASE—Decisions of the U. S. Supreme Court with regard to the participation of the cargo in general average. (R. S. M.)

JERQUER—(**British Term**)—A Customs official whose duty it is to examine the ship's cargo, to prevent goods being imported without paying duty. (J. Steph.)

JIB—A horizontal arm forming one of the principal parts of one class of cranes. The load is suspended by ropes or chains from a trolley or traveller, which can move on wheels in or out along the jib. The jib may swing horizontally, or, with the structure on which it is fixed, may be moved along a track or runway, but the jib does not change its inclination with the horizontal while handling the load. In some special cases the jib is operated in an inclined position, as in inclined-cantilever-jib wharf cranes, but this is a fixed working position, and the trolley moves along the jib while carrying the load, the same as if the jib were horizontal. (R. W.)

JIB, RETRACTING—A jib which telescopes lengthwise. It is sometimes used on cantilever gantry cranes for cargo handling work, with a trolley which can carry loads from the cargo hatch to the pier. The possibility of retracting allows the crane to be moved along the pier without interference from the rigging of the vessel. Also called extensible jib. (R. W.)

JUMPER—An "all-over man." A longshoreman who does not attempt to get steady work at one pier but works all over the port. (Br.)

K

KEDGING—Pulling off a stranded vessel by means of an anchor, carried astern (into deep water) and pulling with the ships windlass at high tide. (R. S. M.)

KEEL BLOCKS—See Blocks.

KING POST—The nautical term for the post or mast of a derrick as installed on shipboard for cargo handling.

Also, the principal strut in a simple form of truss known as king post truss. Derrick booms are occasionally trussed with four king posts placed at right angles around the boom at its middle point. (R. W.)

L

LAGGING—A covering laid on the outside of engine cylinders, boilers, etc., to prevent the loss of heat by radiation. It is usually made of substances which do not conduct heat, like magnesia and asbestos, and is fitted in blocks or molded while in a plastic condition. Canvas, sheet metal or wood are often added to make a serviceable finished surface.

Also, pieces of wood secured to the cylindrical surface of a pulley or winding drum to increase its diameter or to furnish a wood in a place of a metal surface. (R. W.)

LANDER—A man who aids in landing the draft on the pier. (Br.)

LARRY—A small car running on a track, hand or power propelled, which receives bulk material from one or more storage bins and delivers it to the places where it is to be used, making regular trips from one to the other. The load is discharged by bottom or side dumping or, if the car body is of the hopper form, by opening one or more gates in the hopper bottom and discharging through a spout. (R. W.)

LASH—To tie or bind with a rope. (Br.)

LATTICE—Criss-cross bracing of flat bars or structural shapes, riveted to two parallel structural steel members to rigidly connect them and make them act as one to resist external loading. (R. W.)

LAUNCH HIRE—Same as boat service hire. A water taxi rate. (R. S. M.)

LAY—The term applied to the placing of the strands of a rope in their proper relative position. (R. W.)

LAY BYES—Side cuts in narrow channels to enable the ships to be accommodated inside the alignment of the bank. (Shank.)

LEAD, OF A ROPE—The course it follows from end to end. A clear lead signifies that the rope extends in a straight line, without any interference necessitating guide sheaves. (R. W.)

LEADER GEAR—Submarine cables laid down the center of a channel for the guidance of vessels entering the harbor in thick weather. The ship is fitted on port and starboard sides with electric magnetic coils. Equal reactions in both coils indicate the vessel to be directly over the cable and by maintaining that position the channel can be followed. (Shank. R. S. M.)

New York Harbor and Spithead, England, have been experimenting with this equipment.

LIFT—The extent of rise or distance through which anything is raised, as, a crane having a large lift.

The weight of a load lifted by a crane, as, a ten ton lift.

The cycle of operations of a crane, as, the crane makes twenty lifts per hour.

An elevator or dumbwaiter (British.) (R. W.) Also used on the continent, Lift Boy, Elevator, Operator. (R. S. M.)

LIGHT DUES—Port Charges assessed for the maintenance of beacons. (Not in U. S. public harbors) (R. S. M.)

LIGHTHOUSE CHARACTERISTIC—The variation in lighthouse beacon flashes or colors that distinguish it from all others. (Shank.) (R. S. M.)

LIGHTHOUSE—See Making Lights.

LIGHTHOUSE DURATION OF FLASH—A flash of 0.3 sec of a "revolving section" light is of sufficient duration. The more rapid the flashes the more frequently the characteristic of a lighthouse can be repeated. (Shank. R. S. M.)

LIGHTHOUSE FIXED SECTION APPARATUS—The type which concentrates rays in the vertical plane only, and is usually provided with means of occulting the burner to give it a characteristic. This type is capable only of relatively small powers. (Shank.)

LIGHTHOUSE FLASHING OR REVOLVING SECTION OPTICAL APPARATUS—In this type the lenses are built up into faces, each being a gigantic bull's eye lantern. Each lens acts upon the rays from the burner in both the horizontal and vertical planes, this concentrating the light into a parallel beam projected to the horizon. There are several faces or bull's eyes. When revolved on a pedestal it shows a series of flashes (characteristic) to the mariner. (Shank. R. S. M.)

LIGHTHOUSE Focal Plane of—(Also of buoys.) The elevation of the center of the lens above the water or (datum plane.) (Shank. R. S. M.)

LIGHTHOUSE Occulting the burner—Of mechanically darkening the light at regular intervals to give the light a characteristic series of pauses and flashes. (Shank. R. S. M.)

LIGHTHOUSE RANGE—The "geographical range" is the distance at which a light can be seen by direct vision from the bridge of a vessel. This depends upon height above the sea of light and bridge. The light taken at 150' and the bridge at 55' would give a geographical range of $22\frac{1}{2}$ miles. (Shank. R. S. M.)

LIGHTS, RANGE—Lights which indicate the direction of a navigable stream or channel. (B. C. A.) When the two lights show one above the other the vessel is on the course. By day two markers usually on shore or the high one on shore and the low one anchored or more frequently extending out of the water from the bottom indicate the range as a line that shows both range markers in a vertical line. (R. S. M.)

LIMIT SWITCH, TRACK TYPE—A mechanism operated by a car, skip or elevator running on rails or guides, which disconnects the operating motor from the line (thereby usually automatically applying the brakes) when the proper stopping point has been reached. It is usually in the form of a stop or contact placed near the rails and operated by a projecting part of the car. (R. W.)

LIMIT SWITCH, TRAVELLING CAM—A device for controlling the operation of an electrically driven power hoist, causing the stopping, dumping or some other operation to occur at a predetermined point, and consisting of a screw rotated by the hoisting drum shaft, which moves a cam longitudinally, in proportion to the car travel. This cam, which is adjustable operates the switch. For an application, see Skip Hoist, Automatic. (R. W.)

LIMNORIA ANDREWSI CALMAN—Described from Christmas Island, So. Pacific, smaller and less destructive species than *Limnoria Lignorum* from which it can be distinguished only by a specialist. (A. and J.)

LIMNORIA LIGNORUM—Rathke. (Class Crustacea) frequently known as the "Gribble" has been known as a wood destroyer since 1799 when it was identified in Norway. It resembles an ordinary wood louse in appearance and like the wood louse belongs to the order of Crustacea known as Isopoda. The body is from $\frac{1}{8}$ "- $\frac{1}{4}$ " in length with a width of $\frac{1}{3}$ the length. It is slipper shaped with a small head and segmented body. The head has two eyes, two antennae, four pairs of mouth parts, including a pair of strong horny tipped mandibles for boring. There are seven pairs of legs with sharp hooked claws. *Limnoria* destroys timber by gnawing interlacing branching burrows into the surface of the wood. It is particularly dangerous to creosoted timber when it gains entrance at a knot or abraision and destroys the interior. (R. S. M. from A. and J.)

LINE—In hoisting, hauling, fastening, etc., a commonly used general term for a rope, chain or cord, especially when used for some particular purpose, as a tag line, hand line, etc. The terms rope and line are used interchangeably, but since the word line has so many diverse meanings, rope is preferable when appropriate, as hoisting rope, trip rope, etc. (R. W.)

LINER—A piece of metal, usually a narrow strip used for filling a space between two steel plates or between a plate and a structural shape. (R. W.)

LING—A variety of cod fish taken in large quantities off the British coast. (J. Steph.)

LITHOPHAGA ARISTATA DILLWYN—Species of Molusca responsible for much damage to Panama Canal works. (A. and J.)

LOAD—A force applied from without or externally, measured in pounds, or tons. Also, in cranes and hoists, the useful weight lifted. (R. W.)

LOAD, DEAD—Static or non-moving load; load which does not vary. The dead load of a structure is usually the weight of the structure itself, though other dead load may be added, as for example goods stored on the various floors of a warehouse or on a wharf. (See Load, Live.) (R. W.)

LOAD, LIVE—A load which is not static or dead; a load which varies in amount or moves in location. (See Factor or Safety.) (R. W.)

A dynamic or moving load, a load which is varying rapidly, or which is applied suddenly or with velocity. The stresses from such live loads may amount to many times those arising from dead load of equal amount, and much larger factors of safety are necessary. Loads moving on wheels or rollers like crane trolleys or bucket conveyors are considered live loads, as are quick running machines in building above the ground floor. (R. W.)

LOAD, PAY—Useful or net load; gross weight minus weight of car, container, etc. (R. W.)

LOAD ROPE OR LOAD CHAIN—In a hoist or crane, the rope or chain on which the load is lifted. Also in hoisting tackle, the part or rope or chain which leads directly to the load. (R. W.)

LOADER, BOX CAR; CENTRIFUGAL OR THROWING TYPE—A box car loader which is set on the car floor opposite the middle door of the car, and consists of a rotating cage which radial blades driven by a motor. The material to be handled, as coal, is fed into the center of the rotating cage by a belt; screw or other conveyor from an outside supply, and is thrown from it by the centrifugal force due to rapid rotation. A cast iron cylinder with a side opening surrounds the rotor; this opening can be turned to either side and thus govern the direction of throwing, allowing both ends of the car to be filled at one setting. Two rotaries may also be combined in one machine in such a way as to load both ends of the car simultaneously. The hopper into which the coal is loaded may be on the same side as the driving motor car or opposite to it; these arrangements are known as rear feed and front feed, respectively. (R. W.)

LOCAL DUES—Charges peculiar to the port or harbor—Special harbor dues. (R. S. M.)

LOCOMOTIVE, COMPRESSED AIR—A locomotive in which the power is supplied by compressed air, under high pressure, stored in tanks which are carried on the engine frame. (R. W.)

LOCOMOTIVE, FIRELESS—A locomotive in which the boiler and firebox are replaced by a storage tank which is charged with steam and hot water from a stationary boiler. The machinery is similar to that of a steam locomotive. (R. W.)

LOCOMOTIVE, GASOLINE—A locomotive in which the power is supplied from an internal combustion engine. (R. W.)

LOCOMOTIVE, GEARED—A type of steam locomotive in which the power is transmitted from the cylinders to the driving wheels through gearing. (R. W.)

LOCOMOTIVE RACK—A type of locomotive used on heavy grades. The locomotive is driven by a gear which engages with a rack usually located in the center of the track. They may be either electric or steam types. (R. W.)

LOWERER—Any device or machine by which material is lowered under full control, that is, not vertically dropped or slid down an incline. The term is more particularly applied to apron or push-bar elevators running in a reverse direction, and to the various types of fingered and suspended tray elevators when used especially for lowering.

Retarding conveyors of the type used for lowering coal down steep slopes from mine openings are also sometimes called lowerers. (R. W.)

LOWERATOR—Same as Lowerer.

LUFF—To move a load toward or away from the axis of a rotating crane; especially where it is suspended from the end of a boom, to move it thus by changing the inclination of the boom. (R. W.)

M

MAGNETS, LIFTING—An electric-magnetic device called a lifting magnet is extensively used for lifting large quantities of iron or steel. By the passing of direct current through a coil of wire which contains a soft iron core the latter becomes a

strong magnet. This electro-magnet is suspended from a crane and moved to pick up and hold magnetic material during transportation by the crane, after which the direct current source of power is cut off and the material no longer clings to the iron core. (R. W.)

MAKING LIGHTS—Lighthouses of 2nd, 3rd, 4th order not strictly harbor lights but stronger, to assist in making port from the offing.

MAKING-UP PRICE—(British Term)—The price fixed by committee of the Stock Exchange for the carrying over of bargains. It is also the price at which the differences of stocks are transferred through the Clearing House. (J. Steph.)

MANHOLE—An opening in a tank, bin, boiler, etc., of sufficient size to allow the passage of a man's body, the usual minimum dimensions being 11 in. by 15 in. (R. W.)

MANIFEST—Detailed list of information concerning the vessel and its cargo containing (a) the names of the ports from which the merchandise was taken on board; (b) the name, description and build of the vessel, true measure of tonnage thereof, the port to which such vessel belongs and the name of the master of such vessel; (c) a detailed account of all merchandise on board with (a) marks and numbers of each package, (2) number and description of the usual package as to destination, such as barrel, keg, etc.; the names of such persons to whom the packages are consigned and the numbers of the bills of lading issued thereof, the names of the passengers of such vessels with the names of those in the steerage and their baggage, the number of the pieces of baggage belonging to each, an account of all baggage not accompanied by passengers. An account of the sea stores and ship stores on the vessel. (U. S. S. B.)

MARINE LEG—See Elevator, Dock Leg.

MARTESIA—(Marine borer family Molusca)—More nearly resembles a clam in structure. The boring is done with the shells as in the case of the *Teredo* and *Bankia*, but the body is wholly enclosed within the shell instead of being drawn out into an elongated, worm like form as in the other two genera. The boring are usually not more than $2\frac{1}{2}$ " in length nor over 1" in diameter while some species of *Bankia* are reported to reach a length of three or four feet. This genera is also equipped with muscular syphons, incurrent and excurrent. (A. and J.)

MASTER—The person having command of the vessel and may include any person having the chief charge or command of the employment and navigation of the vessel. (U. S. S. B.)

MATS—Woven matting of willows, bambo, reeds, etc., used to hold mud embankments in river correction works. (R.S.M.)

MATRIX—See Concrete.

MEDICAL INSPECTION—See Quarantine.

MERCHANDISE—Means goods, wares and chattels of any description capable of being imported, and includes merchandise the importation of which is prohibited. (U. S. S. B.)

MITRE GEARS—Bevel gears which are equal to size and have their shafts at right angles. The included angle of their pitch surface is 90 degrees. (R. W.)

MITRE POST—The vertical member of a dock gate leaf forming the abutment with the other leaf at the outer end. (R. S. M. Br. Cun.)

MOLE—Latin moles, a mass, is indicative of a large mound, or long ridge of material, heaped more or less regularly, in such a way

as to constitute some protection from rough seas. It fulfills the function of a breakwater. In later times it has acquired the specific significance of a breakwater provided with a broad superstructure capable of being used as an ordinary quay—Piers, Jetties, Moles, Quays, all similar. (Br. Cun.)

MOLLUSCA—A family of marine borers, the most important genera of which are **Teredo**, **Bankia** and **Martesia** all bivalves, related to the clam. (A. and J.)

MONIER SYSTEM—A network of metal bars and wires crossing at right angles bedded in a concrete slab to relieve the concrete of its tensile strength. In arched floors they assist in taking up the compressive stress. (R. S. M. Br. Cun.)

MONITOR—A raised portion of the roof structure of a building, generally astride the ridge, extending part or all of its length, and having the shape of a miniature building. Its side walls are usually glazed for light or provided with openings for ventilation, or both; it has no floor.

In many installations of coal handling apparatus, conveyors are run lengthwise of the building through the monitor, and can dump anywhere in its length into storage bins beneath. The conveyor line is supported by the main roof timbers which extend across its base, and a footway alongside of it gives access for care and repairs.

Also, a kind of car used in lowering coal down inclines. (R. W.)

MONORAIL, ADJUSTABLE LOOP—A system by which a telfer or cage-controlled monorail hoist can serve the whole of a rectangular area by means of a movable bridge on to which the telfer can run. (R. W.)

MOORINGS—A vessel is moored when it is held other than by a simple anchor chain. When secured by lines to buoys, dolphins, wharf. In the U. S. Navy mooring means the system of two anchors with the 2 anchor chains caught together near the bow, by means of a yoke or swivel to prevent chains from twisting; this method reduces anchorage radius. (R. S. M.)

MOORINGS, FIXED M—Owing to the necessity of keeping merchant vessels in constant readiness to slip moorings in destination from those for warships which have large crews, fixed moorings have been developed. Screw moorings in hard bottom have been successful. (Shank.)

MOORINGS, SCREW—Mooring screws have a shaft of 3' to 8', the diameter of the flange being 2' to 4' of cast iron. Two screws carried by a bridle carrying the mooring pennant is most common. The screws are placed to preserve an angle of bridle of less than 45 deg. and a directly perpendicular pull on the screw is impossible. A 4' screw will resist a perpendicular pull of 50 tons. (Shank. R. S. M.)

MORATORIUM—An extension of time allowed under exceptional circumstances by the Government of a country for the payment of debts. (J. Steph.)

MUNGO—The waste produced in a woolen mill from hand spun or felted cloth or from the tearing up of old cloths: used for the manufacture of shoddy. (J. Steph.)

N

NAVIGATION—The acts of laying out a course for a voyage by a vessel upon the high seas (or great inland bodies of water such as the Great Lakes) and conducting a vessel over the prescribed course by means of compass, sextant and chronometer. (R. S. M.)

NAVIGATION—Ordinary condition of N——, is the path of the ship under the influence of the helm and with all screws working ahead. The path followed approaches a spiral curve whilst turning through 32 deg. If the turning is continued the path becomes a circle in quiet water. (Shank. R. S. M.)

NAVAL STORES—Resin and Turpentine. The chief American markets at present are Savannah and Jacksonville, but markets follow the source of supply and move about once every generation. (R. S. M.)

NEAPED—A vessel may enter a harbor at spring tide and find that the depth of water at neap tide is insufficient for the vessel to navigate and get to sea again. Therefore the vessel must lay over at the port during the period of neap tides until the next spring tides. (R. S. M.)

O

OFFING—The approaches to a harbor: the open sea before entering the harbor channels. (R. S. M.)

OFFSET—The distance between two adjacent parallel portions of pipe, track, or other continuous line; the amount the line is set over in going from one to the other.

One of the measurements taken to locate a point or object by means of its distances from two base lines at right angles; a co-ordinate. (R. W.)

OUTSIDE SHIPS—Those ships which have no regular sailings. (Br.)

OVERBURDEN—The material resting on top of a bed of coal, ore, stone, or similar material, the excavation of which is contemplated. Removal of the overburden is called stripping. (R. W.)

OVERCUT—The term applied to a gate or valve for controlling the flow of loose material in a chute when it stops the flow by cutting down into the material from above. This is the usual construction, with vertical sliding gates, and with many quadrant or cylindrical gates. (R. W.)

OVERTIME—Labor performed beyond the contract working day (1½ pay) or upon Sundays and Holidays (double pay.) (R. S. M.)

P

PALLET—A flat platform, plate or sheet of iron, wood or wood covered with iron, used to pile material on, for purposes of handling or transportation, or for such operations as drying, curing, etc. Those of wood standing on high cleats can be easily picked up, trucked and deposited with their loads by trucks or barrows with proper lifting fingers or hooks passing under the pallet. Also called a *hack*.

Also, a flat carrier, usually of wood with the smooth side down, for use in conveying materials such as sacks of cement which will not move if placed on roller conveyors. In a simple system several sacks or similar articles may be piled on each pallet, and after a sufficient number of these loads have run to their destination, the pallets are piled on the roller conveyor and pushed back by hand. Boxes are similarly used for materials which will not stack on pallets. (R. W.)

PARBUCKLE—A double sling made of a single rope, for slinging a cask, gun or other cylindrical burden. (Webster.)

PARI PASSU—In equal proportions. (J. Steph.)

PHOLADS—Stone and Concrete borer, family Mollusca. (R. S. M.)

PIER—A vertical support of an engineering structure. (R. S. M.)

PIER BASE—A short structural steel tower used to give moderate elevation to a crane. A locomotive crane may have a pier base, adapting it for storage yard or cargo handling work. (R. W.)

PIER SHED—A roofed structure or building placed on a pier, generally to prevent damage to stored material by the elements. It may cover part of the pier, leaving open passages along the sides for the movements of cranes or special cargo handling machinery, or it may cover all the pier, in which case the cargo handling machinery must be located on the roof or carried by the vessel. (R. W.)

PILLAR—A post of wood, steel or masonry used to support the floor or a building or other portion of a structure. In pillar cranes, the central column or post by which the boom or jib is supported. (See Crane, Pillar; Crane, Pillar Jib.) The pillar is constructed in various ways, two types being a tapering cast iron column of circular section flared at the bottom where it rests on a heavy base plate. The particular type of pillar crane called a locomotive crane generally has its pillar, which is very short, included as part of the two side frames of the hoisting winch and mounted with them on the revolving platform. (R. W.)

PINION—The smaller of a pair of gears in mesh with each other. A gear with a small number of teeth. (See Gearing.) (R. W.)

PINTLE—A cantilever pin or pivot, like the pivots at the top and bottom of the mast of a jib crane. (R. W.)

PLATFORMS—(Docks and Locks)—The floor fitted with iron or granite tracks over which the lock gates pass. Platforms must have strength to support heavy gates or caissons. (R. S. M. from Br. Cun.)

PLATFORM, SKID—A wood or metal platform elevated a short distance above the floor and resting on longitudinal members or skids. Raw or finished material, or partially finished work is piled on it, and it is picked up bodily and moved to any desired new location by means of a lifting truck of some sort. Boxes of any desired depth may be built on the platform with removable sides or ends. Stakes may be provided around the outside to keep objects from rolling off. Bins or posts to hold objects with holes in them may be inserted; cranks, cradles and all variety of special arrangements may also be used when advantageous. Also called **skid**. (R. W.)

PLUMB—The state of being vertical. (R. W.)

Also, a weight suspended on the end of a cord by which an object is tested as to its vertical condition, or by which a point on one object is set directly over a definite point below. Also called **plumb bob**, or **plumb bob and line**.

PLY—One of the layers of sheet material which goes to make up an article of laminated structure, as fabric belts, veneered wood, etc. (R. W.)

POCKET, RETAIL COAL—An elevated storage bin for holding various sizes of coal, and arranged for delivering to trucks and wagons for retail sales. (See Pocket, Storage.) (R. W.)

POCKET, STORAGE—An overhead bin for containing bulk material, which is delivered to it direct from cars on a track elevated above the pocket, or from boats or cars at a lower level by means of elevating and conveying machinery of various types. The separate compartments are usually formed with sloping or hopper bottoms and are provided with discharge chutes and gates, so that they will completely discharge their contents. They are made of wood rectangular in plan and subdivided by wooden

partitions and whole being strengthened by steel rods. Round wooden or silo-type pockets are often used, usually without subdivisions, each silo holding one size of material.

Steel tank coal pockets are also used, sub-divisions being made if needed by wooden cribbing with steel reinforcement. All pockets are at an elevation above the level on which stand the cars, wagons, etc., receiving the material, and this usually involves a high foundation or supporting framework for the pocket or depressed receiving track level. The driveways on which the receiving wagons or trucks stand are laid out either transversely or longitudinally beneath the pockets, or outside on one or both sides of the structure, corresponding to pockets sloping toward one or toward both sides. (R. W.)

PONTOON BRIDGE—See Bridge.

PORT—Includes any place from which merchandise can be shipped for exportation or at which merchandise can be imported. (U. S. S. B.)

PORT DUES—See Harbor Dues.

PORT WARDEN—Official having jurisdiction over channels, anchorages, moorings, etc., of a harbor and a port. (R. S. M.)

POST ENTRY—The master of any vessel arriving from a foreign port or place and required to make entry (a) shall make a post entry of any merchandise or baggage on board which is not included in or which does not agree with the manifest and (b) shall make a copy thereof and mail to the Comptroller General of the United States. Failure to do so shall be liable to a penalty of \$500 (U. S. S. B.)

PUBLIC STORES—Goods not removed from the wharf or goods not entered within 48 hours after landing are sent to public stores and held as unclaimed at the risk and expense of the consignee, in warehouses known as public stores. (U. S. S. B.)

PULLEY, GUIDE—An auxiliary pulley which is located in such a way as to deliver a belt in the plane of another pulley, either the driving or the driven pulley of the mechanism. For ropes and chains, see Sheaves, Guide. (R. W.)

PULLEY SLAT—A pulley used with belt conveyors handling clay, dirt or other material which might pack between the belt and an ordinary full-face pulley. It is composed of two ends discs or spiders connected by parallel slats, like a squirrel cage. (R. W.)

PULLEY, SNUB—A pair of chain sprockets placed close under the head sprockets on the return side of a double strand bucket elevator, to cause a perfect discharge of the material by completely inverting the buckets. They are placed outside the line of buckets and deflect the chains inward so that they remain in contact with the sprockets for considerable more than 180 deg. Also called choke wheels or deflecting wheels. (R. W.)

PULLEYS, TIGHT AND LOOSE—Pulleys which revolve about the same axis, one being rigidly attached or keyed to, and the other loosely revolving on the shaft. (R. W.)

PUMP, DREDGE—A centrifugal pump used in a hydraulic dredge for drawing the mixture of water and solid material in through the suction pipe and discharging it on land or into a scow. (See Dredge, Hydraulic.) These pumps are designed specifically for the hard service they must undergo, and will handle boulders as large as can pass the agitator blades at the suction head. Dredge pumps are usually driven by vertical engines, often compound, and designed for economical operation. (R. W.)

PUMP, JET—A pumping device in which the high velocity of a small stream of fluid is made to give a slow velocity to a large amount of the same or another fluid, by a process of entrainment and of transformation of the kinetic energy of a large mass at low velocity. Because of the absence of moving parts, fluids containing solids can be handled and the apparatus is simple and cheap, but the efficiency is usually low.

The arrangements in most common use are a water jet pumping water, known as a water-jet pump; a steam jet pumping water, known as an injector or ejector, depending on whether the delivery pressure is high or low; and a steam jet pumping air known as a steam blower.

Water-jet pumps are used for drainage and excavation work, where dirty, gritty water would injure piston pumps. Ejectors are used for the same purpose, the steam being delivered from a stationary boiler, and while inefficient as compared with a piston pump, are simple, cheap and easily installed. Injectors are used for pumping feed water into boilers, and as the feed water, the efficiency is high. Steam blowers are used to produce draft for boiler fires, and are usually applied at the base of the stack, where they act to accelerate the exhaust gases and produce a suction. (R. W.)

PUMP, RELAY—In long pipe lines, a pump placed at an intermediate point to assist in moving the liquid by again raising its pressure after that originally supplied has been reduced by the friction of flow. In the discharge from hydraulic dredges, relay pumps increase greatly the possible length of discharge and remove part of the load from the pump, permitting greater out-put. The pumps are operated by steam or electricity. (R. W.)

PURCHASE—Mechanical advantage; increase of force at the expense of space moved through, as the purchase of a lever or block and tackle. Geared drum winches are also known as single or double purchase according to whether there are one or two gear reductions between the point of power application and the drum shaft. (R. W.)

PURCHASE—The arrangement of pulleys and gear for lifting drafts. "Double purchase" means extra gear used for heavy loads. ((Br.)

PURCHASE, UNION—(English use)—Two winches and falls on one hook. Burton and Fall. (R. S. M.)

R

RACKING—(British term)—The term applied at the Custom House to drawing off, transferring, or combining wines or spirits from tasks. (J. Steph.)

RACK RENT—(British Term)—An annual rent extended to the full value of the thing rented. The highest rent which the land will bear. (J. Steph.)

RAIL, GROUND—A line of rails which is located on the ground, as distinguished from one supported on an elevated structure, building, etc. (R.W.)

RAMP—An artificial inclined path, road or track along which persons, animals and wheeled vehicles may pass primarily for the purpose of ascending or descending or changing their elevation. Foot ramps take the place of stairways; railway tracks set on a steep grade for the purpose of hauling loaded cars of bulk material to be dumped, are sometimes called ramps; moving ramps, formed of platform conveyors, are made to carry loads, men with loaded hand trucks, and even wheeled vehicles like motor trucks; chain

haulage ramps have haulage chains laid in them, to assist heavily loaded trucks either up or down. (R. W.)

RAMP, MOVING—A wood apron conveyor set at a moderate inclination and used for conveying persons, motor trucks, "wheelers" or wheeled trucks, etc., up or down the grade. When the slope is so steep that special arrangements must be provided to prevent vehicles from running down the apron, it is usually termed an apron elevator. (R. W.)

RAT GUARDS—Sheet iron discs with a hole in the middle the size of a mooring rope and split from the center to the edge—(one radius) to permit passing over a mooring line to prevent rats from boarding the ship from shore over the line: therefore the rats walk up the gang plank or ladder. (R. S. M.)

RATCHET—A detent or pivoted piece arranged to fit into the teeth of a ratchet-wheel in such a way as to allow its rotation in one direction, but not in the other. Also called **Pawl, Dog, Click**. (R. W.)

RATCHET, FRICTION—A ratchet which locks a ratchet wheel against rotation in one direction by friction rather than by placing a projection in its path. It is generally a small rounded piece eccentrically pivoted, or a ball or a roller in contact with an eccentric or spiral surface, so arranged that the wheel pushes it aside when rotating in one direction, but brings it into a powerful wedging action when it starts to rotate in the other direction. (R. W.)

REEVE—To pass or thread a rope through pulleys, blocks, guides, etc. (R. W.)

RENTE—(**British term**)—The term applied on the Continent to the National Debt, as, for example, "French Rentes," which are equivalent to our Consols. (J. Steph.)

RESISTANCE—Of the ship to rotation consists of two parts, (1) the water dragged round with the ship and whose influence depends on the variation of the angular velocity—(2) depends on the angular velocity and is operative through the whole time the ship is turning. (Shank.)

RESPIRATORY DISTRESS—(**British term**)—See Bends.

REPORT OF STORES—Manifest of any vessel arriving at port shall specify such articles to be retained on board the vessel as (a) sea stores, (b) ship stores, (c) bunker coal or bunker oil. Any other or greater quantity of sea stores as specified in the manifest, or articles whether shown on the manifest or not, landed without a permit will be liable to a penalty equal to the value. (U. S. S. B.)

RESIDUE CARGO—Any vessel arriving at a port of entry of the United States having on board merchandise shown by the manifest to be destined to a foreign port or place, or (b) arriving from a foreign port having on board merchandise shown by the manifest to be destined to a port in the United States other than port of entry at which such a vessel first arrived and made entry. (U. S. S. B.)

REVERSE CURRENT—A movement of water opposite to the main stream, usually close to shore. (R. S. M.)

RIG—(**British term**)—The secret operations of "Bulls" whereby the price of a security is forced up artificially. It is the manipulation of the market by "Bull" speculators for their own profit. (J. Steph.)

RIVER REGULATION—(1) **The Law of Deviation**—The deepest and the shallowest points in the channel are below the vertex and the ends of the curve respectively.

(2) **The Law of Greatest Depth**—The point of maximum depth is the deeper as the curvature of the vertex is sharper.

(3) **The Law of the Trace**—In the interest of both the average and maximum depths the curves should be neither too short nor too long. On the Garonne River $1\frac{1}{2}$ kilometer.

(4) **The Law of Angle**—For equal lengths of curve, the average depth of the pool is greater as the central angle subtended by the curve is the smaller.

(5) **The Law of Continuity**—The longitudinal channel profile shows gradual variation only when the curvature changes gradually. Abrupt modifications of depth accompany rapid variations in curvature.

(6) **The Law of the Slope of the Bed**—If the curve varies continuously, an increasing radius of curvature marks a reducing depth and a decreasing radius an increasing depth. (Shank.)

RIVER REGULATION—(Width and volume—An increase of volume of water does not occasion a corresponding increase in width of a river, as the scour may deepen the river to such a degree as to narrow the width. (Shank. R. S. M.)

ROCK BORERS—Species of Mollusca, *Pholadidae*, *Lithophaga* which see, destroy rock and concrete.

ROOSTER—A sheave carried in a swiveling bracket on the gudgeon or pivot pin at the top of a derrick mast, and used for giving the boom hoist line a straight lead to the drum on the hoisting winch. The boom hoist line is led up the center of the mast, out at its top, and over the rooster sheave, thus leaving the two sheaves in the mast step free for the hoisting and the closing lines equipped in the two-line bucket operation. Or if only one hoisting line is required, the use of a rooster allows the single line at the bottom to be placed centrally, and the mast can then be rotated a complete circle or more without fouling any line. (R. W.)

ROPE—A flexible connector used for pulling, made of fibrous vegetable materials or of metal wires, if the former, the fibres are twisted into yarns, the yarn into strands, and the strands are then laid into a rope, if the latter, wires are laid into strands and the strands into a rope. (R. W.)

ROPE, ARMORED WIRE—Wire rope which has had its strands, wrapped or served with a winding of metal wire or ribbon before being laid into the final rope. This armor takes all the wear for a long period of time, and materially lengthens the life of the rope. (R. W.)

ROPES, ARRANGEMENT OF HOISTING—In cranes up to three tons capacity the load may be lifted on a single fall of rope. For loads from five to seven tons, two parts are employed, one part winding on the drum. Above this size the load is lifted on four parts of rope, two parts being wound in left and right hand grooves on the drum, and the other two passing around an equalizing sheave. In very large cranes the load may be supported on 16 (or more) parts, two winding on the drum, two passing around the equalizer sheave, and 12 pendent from the upper block. In some cases the ropes ordinarily passing around the equalizer are led to another drum and wound on it.

The above represents common practice in overhead cranes, but there are many variations even in them, and when derricks,

steam shovels, grab buckets, etc., are considered the arrangements in use are exceedingly numerous.

Where sheaves and drums must be kept small as in overhead cranes trolleys, a maximum diameter of rope of 7/8-inch to 1-inch is adopted, and large loads are lifted by increasing the number of ropes; in cases where there is no limit to the size of sheaves and drums, as in mine hoists, one or a few large ropes are used. For small hoists small ropes are used, but it is not desirable to use many parts on account of the great wear of the rope passing around numerous sheaves. (R. W.)

ROPE, CLOSING AND HOISTING—In two-rope grab buckets, the rope which passes through the bucket head, and which, when pulled operates the closing mechanism. (See Bucket, Two-rope.) Also called bucket hoisting rope or closing rope. (R. W.)

ROPE, CORDAGE—Rope which is made from fibrous materials like manila, hemp or sisal. The fibres are of varying length; they are spun into yarns, the yarns into strands, and the strands are laid into ropes, the lay of the strands and the rope always being opposite. It is made up in three or four strands, with or without a center of heart, and is soft, medium or hard lay. The heart, when used, is a small rope having a diameter about one-third that of the strand. (R. W.)

ROPE, HEMP—A rope made from fibres of the hemp plant. While strong and flexible, it decays rapidly when exposed to the weather, and is therefore often tarred. (R. W.)

ROPE, HOLDING—In grab buckets operated by two ropes, the one which is attached to the bucket head and by which it is lowered. (See Bucket, Two-rope.) Also called bucket lowering rope. (R. W.)

ROPE, MANILA—A rope made from fibres obtained from a species of wild plantain belonging to the banana family, and native to the Philippine Islands, the fibres are from 6ft. to 10 ft. long and very strong in tension, though weak transversely. (R. W.)

ROPE, SHELL—The term applied to the holding rope in some types of two-rope grab buckets where the top bucket head is extended downward forming a housing or shell for supporting guides on which the two spades or bowls slide. (R. W.)

ROPE, SISAL—A rope made from the fibres of a plant grown in Yucatan, Mexico and Florida. It is in general inferior to manila in strength, appearance and wearing qualities. It is used for tying or binding purposes, and seldom for running around sheaves. (R. W.)

ROPE, TRIP—A small rope which, when pulled (generally by hand) operates a latch or dog to release a moving part of an apparatus, such as a grab or turnover bucket. (R. W.)

RUMMAGING—(British term)—The name given to the searching of a vessel by the officers of the Custom House for the purpose of ascertaining that neither dutiable nor prohibited goods are concealed on board. (J. Steph.)

RUNNING LINES—A charge paid by the vessel to the Boatman (which see) for the service of carrying the mooring lines ashore and making them fast. Charges range from \$5 to \$15, according to the port and the size of the vessel. (R. S. M.)

RUNWAY—The path or track over which anything regularly runs; a passageway or aisle which can be used for wheeled vehicles whether on rails or not. Also, the term applied to an assemblage of conveyor sections, and particularly to the parts on which the material transported actually rests, as distinct from the supporting structure, driving mechanism, etc. (R. W.)

S

SALVAGE—The recovery of a wrecked or disabled vessel—(1) for the value of the vessel—or (2) to clear harbor channel. (R. S. M.)

SALVAGE—The amount payed the one salving or saving the vessel—old sea practice allows half the salvaged value. (R. S. M.)

SALVAGE—“Patch and pump” method usually applied when vessels are voluntarily stranded after collision. (R. S. M.)

——Cofferdam method, when the sunken vessel is entirely surrounded by a sheet piling and the water pumped out putting the vessel in the dry. This method used on the U. S. S. Maine at Havana. (R. S. M.)

SANITARY DUES—Fees for fumigation, health office inspection, health officer certificates, etc. (R. S. M.)

SAVE ALL—A net hung from ship to pier to prevent the draft from falling into the water. Also a sail cloth placed for protection between different kinds of goods. (Br.)

SCOW—A flat-bottomed boat, generally with flat sloping ends and without deck, used for transporting heavy bulk material such as dirt, gravel, sand, stone, garbage, etc; garbage scow have hopper bottoms, by which the load may be dumped into the water. (R. W.)

SCRAPER, FRESNO—A horse-drawn drag-scoop scraper having a wide and rather short bowl. It is filled by dragging through loose dirt, with the cutting edge slightly depressed, and is dumped by turning over on adjustable runners which allow a complete dump or gradual spreading as may be desired. It is returned on the runners. On account of its short bowl it fills easily, and will follow up a steep bank without dumping. (Also called buck scraper.) (R. W.)

SCRAPER, TONGUE—A drag scraper in which the horses pull the scoop by a forked tongue pivoted to it at its two sides, instead of by chains attached to a bail as in the ordinary drag scraper (R. W.)

SCRAPER, WHEEL—A horse-drawn scraper bucket consisting of a steel pan or scoop mounted on wheels and equipped with levers by which the cutting edge can be lowered to the ground for filling the bucket, and then raised clear while the load is being wheeled to the dumping point. To dump, the back end of the pan is raised until the cutting edge digs into the ground, when the continued pull of the team will dump the load. It is returned in the dumped position. An automatic front gate is sometimes added to prevent the spilling of material during long or rough hauls. (R. W.)

SCREW RACE—The current of water set up by the action of the revolving screw propeller of a vessel. (R. S. M.)

SCREW LIGHTERS—A vessel constructed for the purpose of driving mooring screws in harbors. (Shank. R. S. M.)

SEA STORES—(1) Merchandise necessary for the proper supply of the needs of a vessel and its crew on a voyage. (U. S. S. B.)

SEA STORES—Articles purchased for the use of or for sale on board the vessel, as supplied shall be termed merchandise, and when purchased at a foreign port shall be liable to entry and the payment of duties found to be due thereon at the first port of arrival in the United States. (U. S. S. B.)

SEDIMENTARY TRANSPORTING POWER—Of a river is proportional to the sixth power of its velocity $P = V^6$. If the velocity is doubled the transporting power is increased 64 times. (Shank.)

SEIGNIORAGE—The profit made by the Government on the manufacture of token money. (J. Steph.)

SELECTOR—The man who grades the bananas when they are loaded into trucks or cars. (Br.)

SET-SCREW—A machine screw which prevents relative motion of two parts in contact by being screwed through one, and having its point forced to "set" into the other. It is used generally to secure hubs of small pulleys, etc., to their shafts. The heads are generally square, but may be slotted. (R. W.)

SHACKEL—A stirrup or piece bent into U-shape, with eyes in the two ends, used to attach a link or eye through which it passes, to another similar part by means of a bolt or pin passing through the two eyes. (R. W.)

Used on cargo masts for rigging the burton fall. (R. S. M.)

SHACKLE, GUY—A shackle used for attaching a guy line to a derrick. A thimble or a sheave may be placed on the pin or built to bend the wire rope around preparatory to clamping it to the standing part of the guy. (R. W.)

SHAFT—A long cylindrical machine member rotating in bearings, and subject mainly to torsion. It may have cranks, gears, cams, pulleys or sheaves fastened to it, and transmits power between them by torsional stress in the shaft. When the torsion is only incidental, and bending is the principal stress, the member is called an axle.

In mining a vertical or inclined excavation made in opening the ground for mining purposes. All of the material excavated is hoisted through the shaft, and all tools and equipment required for the work are lowered through it. It also contains the pipes connected with the pumping system, and the lines of power transmission. (R. W.)

The vertical space in which an elevator (lift) operates. (R. S. M.)

SHAFT, CROSS—In bridge cranes, the bridge driving or squaring shaft. (R. W.)

SHAFT, FOOT—The term applied to the shaft carrying the lower of the two principal wheels, or sheaves, round which passes the endless chains or ropes of various types of inclined belt or apron conveyors, continuous bucket elevators, etc. Also called the tail shaft. (R. W.)

SHAFT, HEAD—In elevators, elevator conveyors, mine hoists, etc., the shaft carrying the sheaves, sprockets or drums around or onto which pass the ropes or chains carrying the load. Where the rope or chain is endless, as in bucket elevators, the lower shaft is called the foot shaft in distinction. (R. W.)

SHAFT, SQUARING—The shafting connecting the wheels on the two tracks of a travelling crane, used to drive the crane, and to force the two ends to travel at the same speed and keep the bridge "square" with the runway. At one time cranes were pulled along by a rope, and this shaft had no function except that of squaring. At present it is utilized as the drive shaft, and is geared directly to the bridge travel motor.

In gantry cranes the squaring shaft is carried across the bridge, and extensions down the end frames connect to the wheels by bevel gearing.

Occasionally the crane gets out of square in spite of these arrangements; it can be squared by running it against the stops at one end of the runway, and exerting sufficient pressure to slip the wheels on one side a slight amount. (R. W.)

SHEARS, OR SHAFT LEGS—A type of crane much used in shipyards for fitting out, in which a long boom made of two converging members is pivoted at the bottom on a foundation, and carries the hoisting tackle at the top. It has a small horizontal range by means of the in-and-out seing of the long-legged boom, and the vertical range is limited only by the height of the shear legs. It is never allowed to swing very far forward, and never backward. It is ordinarily swung out by slacking on guys attached to the top and extending to anchorages a considerable distance to the rear. Occasionally a third or back leg is provided, pivoted to the main leg parts way up or at the top, and extending downward to the rear; the lower end is mounted on wheels and is rolled along the ground under the control of tackle or a screw, thus swinging the top outward, or luffing it. (R. W.)

SHEAVE—A wheel or disc of wood or metal, having one or more circumferential grooves shaped to receive a rope or chain, and free to rotate on a shaft. Wood sheaves, as used in small blocks, are generally made of lignum vitae with bronze bushings. Metal sheaves are plain discs; hub, web and rim construction; or hub, spokes and rim; in accordance with the size. A sheave is usually free on its shaft, and without gearing, serving merely to change the direction of the rope passing around it. The term is, however, sometimes incorrectly applied to narrow drums used for winding purposes and to the driven pulleys of a rope drive. (See also Sheave, Chain; Sheave Gravity Plane.) (R. W.)

SHEAVE, ELEVATOR—A special concave surfaced drum of large diameter fastened on the end of the drum shaft of a winch, and used for operating material handling elevators, as in building construction. A rope has its two ends connected to two elevators, or to one elevator and a counterweight, and is passed around the drum for one or two turns. The drum may be disconnected from the winch shaft by a jaw or friction clutch, and a foot-operated band brake enables it to be retarded or held at any point desired. (R. W.)

SHEAVE, FIXED—A sheave whose axis is fixed in location; also a guide sheave. (R. W.)

SHEAVE GRAVITY PLANE—A brake-controlled sheave located at the top of an incline, by means of which control is maintained over a downward moving loaded car which is only partially counter-balanced by the upward moving empty car connected to it by a rope passing over the sheave. A single turn of the rope around a sheave would not give sufficient traction to prevent slipping, so two multi-grooved sheaves mounted on parallel axes and provided with brake bands are anchored to a foundation, and the rope is passed around them in succession in figure eight turns. The rope ends are fastened to the cars. A motor drive is sometimes added to the sheave, to assist in starting, and to raise a loaded car in case it should be necessary. (R. W.)

SHEAVE, GROOVED—See Sheave, Rope. (R. W.)

SHEAVE, GUIDE—A sheave located in such a way that it guides a rope in a desired direction, generally onto a drum, or into the plane of another sheave. (R. W.)

SHEAVE, LOAD—In a chain hoist, the sheave from which the chain or rope carrying the load is pendant. (R. W.)

SHEAVE, ROPE—A sheave having a circumferential groove shaped to fit rope. If for wire rope for power transmission, the groove is shaped so that the rope does not touch the sides; if for hoisting the groove should fit the rope closely to enable it to hold its shape under heavy load. Idler sheaves for manila rope, usually have grooves which approximately fit the rope, but do not wedge it.

Wide faced freely turning sheaves with numerous grooves are usually called **idler pulleys** when keyed to their shafts and used for actual power transmission they are called **rope drive pulleys**. (R. W.)

SHEAVE, WATER—A sheave which is designed for use in a fall or bottom block which passes under water, as in the hoisting of dredge dippers, grab buckets, etc., grease lubrication is usually arranged to prevent grit entering the bearing, and the sheave is thoroughly housed to prevent fouling from roots or other objects. (R. W.)

SHEETING DAM—See Cofferdam.

SHIP'S PROTEST—The document signed by the captain of a vessel, containing a declaration under oath as to the true circumstances under which damage to ship or cargo has been sustained. A copy is usually required when a claim is being made under an insurance policy. (J. Steph.)

SHOVE OFF—(nautical slang)—Originally from the action of a small boat to leave ship, shore or landing, it has come to be applied to any vessel or any individual leaving, getting underway. (R. S. M.)

SHOVEL, CROWDING MOTION—The thrusting motion of the dipper handle of a power shovel, by which it is forced downward or forward into the digging. Two types are in use; the shipper shaft crowd, in which the dipper handle is moved lengthwise (see Shovel, Steam, Crowding Engine); and the horizontal crowd, in which the upper end of the shovel handle is moved horizontally forward. The dipper hoisting motion is operated simultaneously with either of these.

Also called thrust or thrusting motion. (R. W.)

SHOVEL DIPPER—The digging element of a steam shovel or dipper dredge. It consists of a bottom dumping bucket having a hinged dipper door, mounted rigidly (sometimes adjustably) on the end of a long arm called the dipper handle, which can be moved lengthwise by engines and gears mounted on a boom. This engine, called the crowding engine, furnishes the power for holding the dipper against the material to be excavated. The dipper is pulled through the bail around a sheave at the boom end, and thence to the hoisting drum of the winding machinery. The door is hinged to the back of the dipper and is held shut by a latch which can be released by a trip rope operated by the engineer. The dipper is of steel, and the front part, which receives the hardest treatment, is often of manganese or high carbon steel. (R. W.)

SHOVEL, HORIZONTAL CROWDING—A power shovel in which the upper end of the dipper handle may be moved forward horizontally at the same time the dipper is pulled forward by the hoisting rope. It is useful for producing smooth, level cuts, and for tearing up surfaces of roads without disturbing the foundation structure.

Some machines give a very long horizontal "crowd" by having a special arrangement with a scoop travelling along the lower

side of the boom, which is lowered to a horizontal position during filling, and raised and swung for dumping. (R. W.)

SHOVEL, POWER—A power driven excavator, in which the digging element is usually a scoop or dipper mounted on a handle and operated by a combination of a geared attachment to a boom with wire ropes or chains attached to the dipper and also operated from the boom. This apparatus, with its operating machinery, boiler, etc., is mounted on a car with flat or flanged wheels, or on a track-laying truck, and is usually self-propelled. Steam power is in most general use, but internal combustion engines are also used, and occasionally electricity. (See Shovel, Steam; Shovel, Gasoline.)

Several forms of digging element other than the dipper and handle are in use. In some of these a shovel-shaped scoop is thrust forward into the material and is raised, swung and dumped in much the same manner as a hand shovel. This motion is obtained by operating the scoop by a series of linkages and bell cranks mounted on a revolving turntable, or by having the scoop move along the lower side of a nearly horizontal boom, filling as it moves outward, after which the boom is raised and swung to the dumping point. (See Loading Machine, Coal.) (R. W.)

SHOVEL, SHIP—A term applied to a type of power shovel used in unloading grain from the holds of vessels where it is used to move the grain toward the point where the buckets on the marine leg can reach it. It thus serves as a power-operated hand-controlled feeded device for the marine leg. The operating rope is sometimes led down the leg into the hold and thus always toward the leg. (R. W.)

SHOVEL, STEAM—A power shovel operated by steam engine. The type in most common use consists of a digging element in the form of a scoop or dipper mounted on the end of a dipper. This handle is pivoted to a swing in a vertical plane about a horizontal axis or shaft called the shipper shaft near the center of a supporting boom.

The handle can also be run in or out lengthwise by engine-driven gearing mounted on the boom, and meshing with a rack on the dipper handle; this action is termed crowding. The boom is double for a portion of its length and the dipper handle swings between the two sides. (R. W.)

SILL—In a stiff-leg derrick, the heavy timber lying on the ground, and connected to the mast step at one end and the bottom end of a stiff-leg at the other. Also called lie-leg. (R. W.)

SILL—LOCK SILL—The transverse member fitted with carefully dressed timber to form a water tight joint against which the bottom of the lock gate rests, when closed, to form a water-tight joint. The sill may extend 18" to 3' above the level of the dock floor. The depth of water over the sill is the controlling depth for the use of the dock or lock. (R. S. M.)

SILTING—When the suspended matter, or silt, in a stream is in excess of the **sedimentary transporting** power of the current the suspended excess is dropped.

This occurs in slack water such as pier slips, that "silt" or fill up more or less rapidly according to the quantity of solid matter brought down by the current. (R. S. M.)

SKIN DAM—See Cofferdam.

SKIP—A shallow, flat-bottomed, straight sided wooden box reinforced with iron fittings, with top and one end open, supported by three chains leading to a common ring for hanging on a der-

rick hook. The chain supporting the open end is provided with a trip hook for dumping. Used for dirt, rock, etc., and filled by hand shoveling, when a grab bucket is not available. Also made of steel throughout. Sometimes called derrick skip or stone skip.

The term is also sometimes applied to a similarly used flat, rectangular wooden platform with rope slings from each corner connected to a ring at the point of attachment of the hoisting rope. (See also, Skip Car; Skip Bucket; Skip Hoist; Scale Box.) (R. W.)

SKIP CAR—A four-wheel car arranged to run on the track of an inclined skip hoist. It is open at the front end; often the top is also partly or entirely open. The wheels are mounted on two through axles beneath the car, or, in some cases, on spiders riveted to the sides of the car. The rear wheels have an extra wide tread, sometimes of two diameters, the outer treads being used only at the top of the hoist for dumping purposes. A bail is attached to the sides or bottom of the car partly or entirely surrounding it, and to it is attached the hoisting rope which leads to the winch drum. A second rope is led to a counterweight; sometimes two cars are used each serving to counterbalance the other. Occasionally a skip car runs on a vertical track, the hoisting line being led off at such an angle as will keep the wheels against the rails. (R. W.)

SKIP HOIST—An arrangement for the intermittent hoisting of material in bulk, consisting of a tower with guides, or an inclined runway with tracks, on which the load carrying skip, often called a skip runs. Wire hoisting rope leads from the skip overhead sheaves and leading sheaves to a single drum hoisting winch (usually electrical) which is operated through a control panel. A push button for starting and stopping is located where convenient. A hopper with loading spout and gate at the bottom is arranged for loading the skip when it is in the pit, and it is emptied at the top by dumping.

The various operations may be manually controlled, partly automatic, or fully automatic. For methods of dumping, see Skip Car. Skips are also used in mine shafts for hoisting material to the surface, the arrangements being similar to those described, except that the capacity is usually very large. (R. W.)

SKIPPER—The captain of a vessel or slang for the commanding officer of a company of marines. (R. S. M.)

SKIPS OR SKIPHOISTS—Travelling overhead buckets for transfer of material, such as the skip hoists for charging a blast furnace. (R. S. M.)

SHENANGO—A longshoreman who does the odd work on lighters and barges. (Br.)

SLACK-ROPE—The rope which is used to tighten the track rope in a slack-rope cableway excavator. One end is led to a winch drum, and the other after being reeved through a block on the end of the track rope and another on the tower, is dead-ended on one of them. (See Excavator, Slackrope Cableway.) (R. W.)

SLEWING—(Also Spelled Sluing)—The act of rotating a crane about its vertical axis, often called swinging. Performed by hand in small crane but it is a power operation in larger ones. There are two common methods; by means of a grooved wheel fast to the bottom of the mast, which is pulled around by ropes wrapped around its circumference (see Bull Wheel); and by a large ring gear fast to the foundation or base, with teeth on

its circumference meshing with a small pinion projecting down from the revolving platform above, and driven by power in either direction desired. (R. W.)

SLINGING—A shipping term used in some ports of the United Kingdom, meaning a charge for putting the chains around the goods as they lie in craft alongside the ship, to facilitate the hoisting of the goods on board. (J. Steph.)

SMUGGLING—If any person knowingly or wilfully, with intent to defraud the revenue of the United States, who clandestinely introduces into the United States any merchandise which should have been invoiced, (b) or makes out or passes or attempts to pass, through the customhouse any false, forged, or fraudulent invoice every such person, his, her, or their aiders and abettors, shall be deemed guilty of smuggling. (U. S. S. B.)

SONIC DEPTH SOUNDER—Introduced by the U. S. Navy. The design of this device is based on the principle of coincidence of reception of sound impulse with the echo (from the bottom) of the previous impulse. Adjustment is made when a key closes the transmitting circuit the impulse is heard in one telephone receiver of a head set. After a definite interval the echo is heard. The rate of impulses is adjusted until the train of impulses coincide in both ears. The rate of the interval in terms of 4950 feet per second gives the depth. (Shank. R. S. M.)

SPAN—The distance reached across by a bridge, a girder, a beam, a rope, etc. The span of a crane bridge is the distance between centers of the rails at each end. (R. W.)

SPAN—A rope fastened at both ends to any objects; generally to the masts. It is used for the up-and-down fall. (Br.)

SPAR—A general term for mast, boom, and gaff. (Br.)

SPARDECK—The upper deck. (Br.)

SPHAEROMA QUADRENTUM SAY—(*Sphaeroma destructor* Richardson—*Sphaeroma pentadon* Richardson)—(1) from Beaufort, N. C. (2) East Coast Harbor. (3) West Coast. Genus allied to *Limnoria* which it closely resembles in structure, it is much larger, olive and reddish brown, $\frac{1}{2}$ " long by $\frac{1}{4}$ " wide. (A. and J.)

SPOIL—The term applied to the material removed in making an excavation either on land by excavating machinery, or under water by dredging. (R. W.)

SPOIL BANK—A long pile or heap of excavated material, usually placed parallel to the longest dimension of the ditch or other excavation being made. (R. W.)

SPOOL—A name sometimes applied to a drum, especially when the surface is concave and it is used as a winch head. On winches used for miscellaneous hoisting work, a split spool is sometimes furnished to be attached to the main winding drum when desired to operate a counterweighted material hoisting elevator by an endless rope which makes several turns around the spool. (R. W.)

SPOUT, DOCK—A long spout receiving the discharge of grain or similar bulk material from an elevated hopper or conveyor in a building on a wharf and delivering it into the hold of a vessel alongside. The upper end is provided with a turnhead which permits it to swivel about a vertical axis; it can also swing about a horizontal axis. The lower portion of the spout telescopes outside of the upper, permitting it to be withdrawn from the vessel's hold by block and tackle. The weight of the entire spout is carried by a tackle hanging from a swinging boom.

SPOUT, FLEXIBLE—A spout which is constructed of a number of cylindrical or slightly tapering pipe sections, fitted into each other, loosely attached by chains, and hanging from the top section, so that the lower end may be moved about and the emerging material deposited where desired. This construction is used with the chuting of concrete and in grain, gravel and sand handling and loading operations. Also called flexible chute, and elephant's trunk chute or spout. Occasionally the sections telescope within one another for vertical adjustability, and for convenience in handling. (R. W.)

SPOUT, MAGNETIC—A spout which contains an electro-magnet so placed that it will attract and hold all pieces of iron which may accidentally get into a stream of material passing over it, and prevent them from passing into a crusher or other machine which would be injured by their entry. The magnet is usually located in the bottom of the spout, and provision is sometimes made for the automatic opening of a door just beyond the magnet to discharge any accumulated iron onto the floor and not into the crusher, in case the electric current fails or is accidentally turned off. (R. W.)

SPOUT MEASURING—A vertical or nearly vertical spout which is provided with gates at both top and bottom and is used as a means of measuring coal or other material delivered through it from a bin or hopper above. An interlocking device prevents the opening of the two valves at the same time, and a counter attached to the lower gate records the number of spoutfuls which have been discharged; this multiplied by the calibrated contents of the spout will give the volume delivered. Used for measuring the coal delivered to boiler stoker hoppers. (R. W.)

SPUD—A device used for anchoring a dredge or other floating craft to the bottom or bank of a body of water. The usual form consists of a vertical timber sliding in guides attached outside the scow side, or in a well formed within the hull. Two are always placed near the front and two at the sides at the stern or one in the middle of the stern. The spuds are raised by tackle, the ropes of which are lead to winch heads on the hoisting engine, or to rack and pinion gearing operated by hand or by power. When lowered and forced into the mud bottom, they hold the scow sufficiently firmly to resist the thrust of a dipper. Another type known as a bank spud is used on dredges in excavating narrow channels, such as drainage canals, etc. It extends out diagonally downward from a gallows frame, with a pad on its lower end resting on the bank. Another short arm from near the deck also connects to the spud near its lower end, thus bracing it securely. With this type of spud the scow can be built narrow for narrow ditches, and still be free from danger of capsizing during operation. (R. W.)

SPUD, TELESCOPE—A bank spud used on dredges in which one part sliding within another may be extended at will to any desired length, thus adjusting for different heights of bank. (R. W.)

SQUARE OF THE HATCH—The space at the bottom of the hatch. (Br.)

STABILITY—Having a tendency to return to its original position of equilibrium after being disturbed therefrom. A stable body or structure resist strongly a tendency to displace it from its position of equilibrium, or, if it is displaced, tends strongly to return to its former position. The question of stability is exceedingly important in all self-supporting cranes in which the load may

be carried outside the outline of the base supports, as pillars, locomotives, horizontal rotating, cantilever jib, all tower cranes, etc. Wind pressure also tends to overturn such structures, and must be taken into account.

The various methods of gaining stability are: anchoring to a heavy masonry foundation—possible for fixed cranes only; using fixed or moving counterweights, placed opposite the load to be lifted, which is the most common method; using outriggers or temporary guys, which virtually increase the size of the base and convert the travelling crane temporarily into a fixed crane. (R. W.)

STAGE—A loading platform built up temporarily in the square of the hatch to assist the hold gang in stowing or breaking out. (R. S. M.)

STAGGERED—Arranged in diagonal rows. Said of rivets, perforation, etc., when those in one row are one-half the pitch ahead of or behind those in the next adjacent row, instead of being abreast. (R. W.)

STAITH—A short tongue or jetty within a dock for coaling purposes. (R. S. M. Br. Cun.)

STEERAGE DECK—Main Deck. (Br)

STEERING QUALITIES OF A SHIP—The factors are (a) time taken to put the helm over to the maximum angle.

(b) the pressure on the rudder.

(c) the moment of inertia of the ship and water moving with her about a vertical axis through the center of gravity.

(d) the moment of resistance of the ship in rotation. (Shank.)

STEP—To step is to fasten; e. g., to step a mast from the ship's side. (Br.)

STIFF-LEG—One of the struts or props used to hold erect the mast of a stiff-leg derrick. It is attached to the top of the mast at one end, and to a ground anchorage, or the end of a lie-leg, at the other, by gooseneck iron and stiff-leg iron respectively. (R. W.)

STIFF-LEG, BROKEN BACK—A stiff-leg with an upward pointing crook or angle in it, arranged to completely clear a derrick boom and allow a full circle swing. An additional short strut from the break or angle to the ground is generally used to stiffen the crooked stiff-leg, and occasionally two of these additional short struts are used for each stiff-leg, firmly holding it in position against side deflection. (R. W.)

STIFF-LEG IRON—A metal fastening or strap for securing the lower end of a derrick stiff-leg to a sill or to an isolated anchorage. (R. W.)

STOOL—A pile of bags of packages in the square of the hatch on which drafts are landed. (Br.)

STOP, LIMIT—A device to prevent overhoisting in a crane or hoist. In electric cranes it is generally arranged to make the hoisting circuit inoperative at a certain point; one system relies on the closing of an auxiliary circuit, and another on its opening, for this purpose. The electrical arrangements can be so made that the lowering circuit will operate as usual when the controller is shifted to the lowering position; and over-hoisting is very simply remedied. On the other hand, working on the theory that habitual use of the limit stop and reliance on its action will cause it to wear and eventually fail to operate at a time the operator is inattentive, some designers arrange matters so that it is some considerable trouble for him to start the load down

after he has thrown the limit stop, thus forcing him habitually to stop the hook before reaching the limit.

In skip hoists over-travel must be prevented at either top or bottom, and the skip brought quietly to rest; this is performed automatically in modern electrically operated installations. (See Skip Hoist, Automatic; Limit Switch, Travelling Cam.)

In mine hoists the work performed by the limit stop is usually combined with other functions in a mechanism called a safety stop or hoist controller. (See Controller, Hoist.) (R. W.)

STORAGE, GROUND—The term sometimes applied to storage systems where an entire supply of bulk material is carried at ground level. It is also used to designate a combination system in which a portion only of the material is held in elevated bins for immediate use or distribution, the larger part resting directly on the ground. (R. W.)

STORAGE SYSTEM FOR COAL—A method of accumulating and handling large quantities of coal, and involving (a) receiving or unloading apparatus for receiving the coal from dump cars or boat unloaders, (b) conveying apparatus including cranes by which it is taken to (c) crusher or screens or both, or direct to (d) storage piles on the ground or elevated bins. There is also a means of (e) reclaiming the coal from the storage pile and delivering it to (f) the conveying system which delivers it to storage bins above furnaces where it is to be burned or to cars into which it is reloaded. Most plants also have a means of passing direct from (c) to (f), omitting the storage.

The same systems may be used for anthracite or bituminous coal, but owing to the freedom from spontaneous combustion of the former, it may be piled to much greater heights, allowing radically different plans to be used for anthracite.

Systems are sometimes distinguished according to the shape of the storage piles as, (a) circular conical piles with the point of supply at the apex of the cone, or moving up one leg of a two-legged truss spanning the pile; (b) piles rectangular in plan and included under the area covered by the bridge of a large travelling gantry or overhead travelling crane called a storage bridge; (c) annular piles outside of a circular track on which a locomotive crane may move, usually combined with a circular or two circular segmental piles within the circular track; (d) long heaps, between tracks spaced so that locomotive cranes can reach the combinations of circular and longitudinal heaps. In the system as described, the crane can place itself so that it can reach to any remote part of the pile, and by merely swinging, dump the grab bucket into the cars or reclaiming hopper. Indefinite extensions can be made by extending the circular track by inserting straight or large radius curved sections, but the crane will then have to handle some of the coal twice, or else travel along the track some distance with each bucket load before dumping it. (R. W.)

STORAGE FOR COAL, CIRCULAR SYSTEM—A system of our-door ground storage for coal, in which two widely spaced parallel straight railroad tracks discharge their coal into a track hopper located between the tracks, and at the center of the pile. A locomotive crane travels around this hopper on a circular track digging the coal from it by means of a grab bucket, and depositing it anywhere within the circumference of a circle having a radius equal to twice the length of the crane boom. In

reclaiming, the coal is dug from any point by the Bucket, and loaded directly into cars.

The capacity of the pile is a maximum when the crane tracks are also covered, but as this prevents the crane from promptly getting at any desired portion of the pile in case of fire, it is not always utilized.

As to methods of delivery to and reclaiming from storage, there may be one or a combination of the following devices: (a) scraper conveyor, usually of the flight type, (b) belt conveyor, with travelling tripper and short cross belt conveyor combined as a stacker, (c) drag bucket, (d) overhead bridge and grab bucket, (e) dump car on automatic railway, or cable railway, (f) locomotive crane and grab bucket, (g) portable conveyors. (R. W.)

STORAGE FOR COAL; DODGE, OR CONICAL PILE SYSTEM—A system of ground storage of which the unit includes two conical piles each spanned by a two-legged truss peaked at the center for storing, and a horizontal swinging scraping conveyor between them for reclaiming from either pile and delivering to a conveyor.

One leg of the two spanning each pile contains a storing scraper conveyor which elevates the coal along the leg until it drops to the pile over the end of a steel ribbon which forms the bottom of the trough and which is gradually pulled up the truss as the pile grows, unwinding from a drum at the bottom. The angle of the leg is the angle of repose of coal, about 27 deg.

The reclaiming conveyor is a horizontal bridge pivoted at its delivering end, and swinging radially in either direction on a number of rails under the control of cables led from the pivot, out to the end of the bridge and thence at right angles to anchorages at either extreme of its swing. The chains of a reversible roller flight conveyor pass completely around the bridge in a horizontal plane, the flights being on end relative to the ground, and scrape the coal toward and past the pivot up an incline from the end of which it is dumped into railway cars. (R. W.)

STORAGE FOR COAL; STUART OR CONVEYOR SYSTEM—A ground storage system for coal in which it is delivered to the end of a belt conveyor running longitudinally in a trench through the storage area. A high travelling tripper discharges the coal from the belt into a short reversible inclined belt conveyor at right angles, which can be placed on either side, to elevate and discharge the coal to storage. This discharging outfit is called a **stacker**.

To recover, a **reclaimer** travelling on the same track is used. It consists of a short section of belt or apron conveyor terminating in a sort of plow, pivoted on a truck so that it can swing, and mounted so that it can be thrust forward under the coal in the pile the coal being thus fed to the reclaim conveyor. This carries it back to the main conveyor belt which conveys it to its destination. (R. W.)

STORE DOOR DELIVERY—The carting of inbound freight from the terminal directly to the address of the consignee by the carrier or a privileged trucking company operating under contract with the carrier or the consignee. (R. S. M.)

STRAIN—Deformation of a body due to the application of a load and the resulting stress. A stress produces a strain, expressed in inches per inch of length. (R. W.)

STREAMING—See tow boat charges.

STRESS—A force acting within the substance of a body, or internal resistance, tending to prevent deformation due to the application of a load. Measured in pounds or tons per square inch of section. (See also Strain.) (R. W.)

STRUT—A brace or support for the reception of direct thrust or pressure; a piece designed to resist pressure in the direction of its length. Also called (under certain conditions) prop, column, brace. (R. W.)

STRUT GATES—(Lock)—Are auxiliary frames or shores which support the main ebb gates in their closed position and enable them to withstand a weight on the outer face, and to resist the onset of waves at or about high water. (Br. Cun.)

SUBMARINE SOUND SIGNALS—In 1923 there were 127 sending stations and 3000 vessels equipped with reception gear. Sound travels 1100 ft. sec. in air and 4950 ft. sec. in water. The sending mechanism is a very heavy brongze bell. Receiving membranes located on both bows of a vessel when heard in unison indicate the bell dead ahead. The lightship with the bell can then be picked up and a known point of departure taken. (R. S. M.)

SUN VALVE—An apparatus for turning on and off of the light of a beacon or buoy morning and evening. The principle involved is that a white burnished surface absorbs less light, therefore less heat than a black surface. Two balanced and connecting bulbs of ether, half liquid and half vapor will tilt to one side or the other accordingly as the heat absorbed by the black bulb causes the liquid ether to vaporise forcing the liquid out of the black bulb into the burnished bulb which becomes heavier and tilts the balancing arm and breaking contact that extinguishes the light. (R. S. M. Shank.)

SURGE—A compound, or reacting wave action—usually a continuation of the vessels wash, acting and reacting in opposite directions. (R. S. M.)

SURVEY—The inspection of a ship in drydock and otherwise to determine her seaworthiness performed by a surveyor representing the Underwriters and/or the American Bureau of Shipping, Lloyds, etc. (R. S. M.)

SWITCH, CROSSOVER—A switch inserted at the intersection of two lines of overhead monorail track, by which either line of track can be made continuous at will, for trolleys to cross over. In one, known as a rotary cross-over, a short section of runway at the junction is supported from a small turntable immediately above it and may be rotated by pendant chains, bringing it into alignment with either track as may be desired. (R. W.)

SWITCH, LIMIT—A term applied to a switch used for overhead monorail track, in which a horizontal sliding frame carries two (or three) short sections of the runway track fastened to its lower surface, and determines by its lateral position which of two (or three) paths shall be followed by a trolley. It is termed single or double according to whether a trolley approaching on the single track can follow one of two or three possible paths. The switch is operated by pendant chains, and is locked in place when in alignment. This type of switch, like the turntable and turntable switch, is used when there is not space enough for the ordinary tongue switch. (R. W.)

SYNOPTIC CHART—A chart upon which meteorological data is plotted to show graphically the distribution of barometric pressure, the direction and velocity of the wind, the state of sea and sky,

etc., taken on fixed meteorological stations on land. (Shank. R. S. M.)

SYNOPTIC DATA SYSTEM—Used in the transmission of wireless weather bulletins to enable mariners to predict the direction and force of the wind and the type of weather likely to be experienced. (Shank.)

T

TACTICAL DIAMETER—(of a ship when turning)—Is the perpendicular distance between the ship's original line of advance and her position when she has turned 16 points: It is in fact another term for the transfer for 16 points. (Shank.)

TAG LINE—A line leading from a near corner of a grab bucket to the cab of a locomotive crane operating it, and held under tension by a counterbalance weight, to keep the bucket from rotating and fouling its supporting and operating lines. Also, a line attached to any load being lifted by a crane, to keep it from rotating, or to slew the crane by hand, in case no power slewing gear is provided. (R. W.)

TALE QUALE—(British usage)—When goods are sold "to arrive," the expression signifies that the goods are equal to sample when shipped, but the buyer takes the risk of any damage or deterioration during transit. (J. Steph.)

TALON—The slip attached to a bearer bond. It is used in applying for further interest coupons when the previous issue is all used. (J. Steph.)

TANK, SETTLING—A device used for separating sand into various degrees of fineness by utilizing the variations in time required for the different grades to settle out of a stream of water. A single tank or box may be used to reject all particles below a certain size, or a series of tanks may effect the separation into a series of graded sizes. The boxes or tanks are automatically self emptying, or are emptied by hand shoveling, by small grab buckets, or similar implements. (R. W.)

TELLTALE—A device which gives audible or visible indication of the beginning, progress or completion of an operation, on some piece of machinery; an automatically operated signal. (R. W.)

TELL TALE—A mark on the up-and-down fall to guide the drumhead man. (Br.)

A plumb line and scale of degrees to give the degrees of list of a ship from the perpendicular. (R. S. M.)

TEREDO AND BANKIA—Of *Malusca* family are similar in method of attack and general appearance. The two (2) valves of the shell (clam) function as a highly specialized boring mechanism: the long slimy worm-like body fills the burrow, which is lined with a calcareous coating. Both *Teredo* and *Bankia* are supplied with very long siphons and with so-called **pallets**—one siphon incurrent and one excurrent. (A. and J.)

TEREDO SPECIES—*Teredo Navalis* Linn—Widely distributed and very destructive, 20" long.

Teredo parksi Bartsch. Hawaii, Samoa, P. I.

Teredo furcillatus Miller. Hawaii, Tutuila, of little economic importance.

Teredo affinis Deshayes. Reunion Island.

Teredo samoensis Miller. Similar to *furcillatus*.

Teredo tralliformis. Miller.

and 19 more species listed and described. (A. and J.)

- TERMINAL**—(1) (The end of a movement in transportation.) (R. S. M.)
(See previous card.) (2) The buildings, structures and equipment at the end of a transportation movement for the transfer, handling, delivery and reception of passengers and freight. (Lambert.)
- THALWEG**—(from German)—The buried channel of a river. "Full 30 feet below the present river course, in some places lies the ancient channel of the Thames. In many sections the pebble bed is 16 to 20 feet thick and contains the fossils of the mammoth and other animals of that period in history." (Shank.)
- THERMOSTAT**—An instrument which is operated by change of temperature, and which is often used to control the source of heat (or coal) so as to maintain as nearly as possible a constant temperature. As an example, a thermostat on the water cooling system of a motor truck serves to maintain a more nearly constant temperature than would otherwise occur. (R. W.)
- THWART SHIP BEAMS**—The transoms of the hatchway running athwart the ship, transversely to the fore and afters. (Br.)
- TIDAL VELOCITY**—Approaches the maximum at about half tide. (Shank.)
- TIE OR TIE ROD**—A structural member designed to resist tension in the direction of its length. Top braced jib cranes are braced by tie rods. The boom of a pillar crane is also connected to the top of the pillar by a tie rod. (R. W.)
- TIPPLE**—A structure designed to transfer material from one system of transportation to another, largely by force of gravity available on account of differences in elevation of various parts of the structure.
Also, a car dumping device. (See Car Dumper.)
In a narrower sense, the term means a building erected close to the mouth of a mine into which mined material (as coal) is delivered by cars, conveyors, chutes, etc., where it is screened, separated from refuse or otherwise prepared for use, and from which it is delivered, generally by gravity, to railway cars or other conveyances for transportation to more or less distant points. It may vary from a simple trestle with a car dump and tracks below on which receiving cars may stand, to an elaborate structure with many levels and conveying and elevating devices, screens, picking tables, etc., and a complicated system of tracks or a yard in which the receiving cars are handled. (R. W.)
- TONS**—Deadweight ton capacity is the cargo carrying or lifting power of a vessel measured in long tons. It is the difference between displacement light and displacement loaded. (R. S. M.)
- TORQUE**—Turning moment, or tendency to turn, of motors, engines, shafting, etc. It is expressed in pound-feet, and is the force which would be exerted at a point one foot from the axis of rotation if an arm were to be fastened to the shaft. (R. W.)
- TOW BOAT CHARGES**—**Docking**—A towboat charge for assisting a vessel from the channel into its berth. (R. S. M.)
Shifting—A towboat charge for moving a vessel from one berth to another within the harbor. Docking and streaming charges frequently added to this intra harbor towing service by the towboat men. (R. S. M.)
Streaming—A towboat charge for assisting the vessel out of berth and into channel. (R. S. M.)
- TRAILER**—Truck or lorrey used with a power tractor or puller. (R. S. M.)

TRAMP SHIP—A ship which has neither regular sailing nor a regular place to dock. (Br.)

TRANSFER—(of a ship when turning)—The distance the center of gravity of a ship has transferred (moved sidewise) in a direction at right angles to the line of her original course. (Shank.)

TRANSFER CAR—A self-propelled car used for regularly transferring bulk material from one point to another in an industrial plant, as for example from an unloading machine to bins, pockets or ground storage. Transfer cars are made with hopper bottoms, gable bottoms dumping in both sides, or sloping bottoms dumping on one side. They are usually electrically operated and run singly, though trains of transfer cars are sometimes used. A power operated transfer car may also draw a tailer. (R. W.)

TRAVEL—To move a given distance along a definite path. The bridge of a crane is said to travel, and the trolley is said to traverse the bridge. To move in a longitudinal direction. (R. W.)

TRAVERSING BRIDGES—See Bridge.

TRAVELLER—A wheeled car or carriage capable of movement to and fro along a rope, elevated beam or bridge; a trolley. (R. W.)

TRAVERSING CAISSONS—All caisson lock gates whose motion is rectilinear.

(1) Sliding caissons are provided with keels or rubbing plates on their undersides on which they are hauled over sliding ways set in the floor of the caisson berth.

(2) Rolling caissons—the sliding ways are replaced by rollers, attached either to the underside of the caisson or to the pathway.

(3) Ship caissons—Have the form of a navigable vessel, and float when pumped out. (R. S. M. Br. Cun.)

TRIMMING IN BUNKERS—An additional charge added to the cost of coal and the cost of tipping or loading for the work of levelling the coal within the bunkers. (R. S. M.)

TRINITY HOUSE—The Honorable corporation of—the general light-house authority of England. (R. S. M.)

TROLLEY—In hoisting machinery, a wheeled carriage or truck which can move along an overhead runway provided for it, and which is used as part of a crane in connection with a hoist, either built into it or hung onto it. It may be moved along the runway by direct pushing, by gravity, by hand or power operated gearing working through the wheels, or by power or hand pull on ropes or chains directly attached to it. Some of the various forms of trolleys are as follows: **Monorail**, or **two-rail**; **single** or **double I-beam**; **plain** or **geared**; **top running** or **bottom running**; **deck bridge** or **through bridge**; **single** or **tandem**.

The principal parts of a trolley for a two girder bridge are; side frames, machinery and load girts, wheels, axles, bearings, motors, shafts, gears, brakes, drum, hoisting rope, equalizer sheave, top block, bottom block, and load hook.

Also called **carriage carrier** (especially for monorail types), **crab**. (British.) (R. W.)

TRUCK, FOUR-WHEEL DRIVE—A truck which has power supplied to all four of its wheels, making them all productive of tractive effort. Wheels which drive and steer at the same time must have special universal joints or equivalent arrangements in the shafts to permit the two motions to take place. (R. W.)

TRUCK, FOUR-WHEEL STEER—A trailer truck which has its steering knuckles interconnected by steering rods in such a way that the pairs at opposite ends move symmetrically in response to a

side movement of the coupling at the front end produced by the tractor passing around a curve. The trailer will track perfectly, and can be hauled from either end, though it cannot be manoeuvred easily by hand. (R. W.)

TRUCK, INDUSTRIAL—A general term applied to trackless wheeled vehicles of various descriptions used for conveying material within buildings of an industrial establishment, from one building to another, or, for limited distances, around the grounds of such a plant. For short distances and small capacities they are usually hand operated; for longer distances and larger capacities they are operated by electrical or gasoline motors. (See Truck, Motor.) (R. W.)

TRUCK, PLATFORM—A truck consisting of a horizontal platform supported on four wheels. It may be operated by hand, may have its own motive power, may be pulled by another truck having motive power, thereby acting as a trailer, or may be pulled by a cable. The platform may be single, or have several decks; one or more sides may be inclosed by stakes or solid walls, or special racks to suit material may be provided. (R. W.)

TRUCK, RADIAL—A two-wheel truck which is free to turn about a pivot on the center line of the car under which it is placed, radius bars being used to connect it with this center. (R. W.)

TRUNNIONS—A pair of cylindrical projections on opposite sides of an object, and supported in bearing in such a way that the object can rotate about the axis of the trunnions, as ladle trunnions, bascule bridge trunnions, etc.

Load hooks are sometimes suspended on trunnions, supported in bearings in the frames of the load block, to prevent the load block being tilted, due to improper arrangement of slings on the hook. (R. W.)

TUB—A bucket, or tub, of wood or iron with iron handle, used for the hoisting transfer and handling of bulk cargo, such as coal, ore, chalk, sand, etc. (Br.)

TUNNEL—The covered way in the lower hold through which the propeller shaft runs. (Br.)

TURNING—Factors of a ship when turning see: **Advance Drift angle; Final diameter; Tactical diameter; Transfer; Steering qualities; Navigation, ordinary conditions of**—N. (R. S. M.)

TURNBUCKLE—A device for connecting two parts of a bar, rod or rope together with an adjustable tension. It consists of a sleeve with internal right hand and left hand threads at the two ends screwing onto correspondingly threaded bar ends or shank of eyes. Or it may have a swivel at one end, and a right hand thread at the other. The sleeve is turned by a wrench or by a bar through a hole in the center. (R. W.)

TURNTABLE—A circular platform mounted on a pivot at its center and with wheels or rollers around its periphery turning on a circular rail underneath, the whole being capable of revolution in a horizontal plane. A transfer table in which the motion is rotary. Rotating cranes of the pillar or self-supporting variety are constructed with the pillar, boom and hoisting machinery.

Locomotive turntables are constructed with a complete circular table with several tracks, or may be simply a long girder with one line of track, supported by wheels at the end.

The turntable of a locomotive crane consists of a base ring (which generally has teeth cut externally or internally and is used for slewing by power) on which rest the wheels or rollers. These may turn on pins directly carried by the rotating frame,

or they may be carried by a separate cage, interposed between the circular track on the base and a similar circular track on the rotating frame. At least four rollers are used, two at the front, and two at the rear opposite the boom; sometimes four are placed in front under the boom, and there is often a complete circle of rollers, this always being the case when a separate cage is used. (R. W.)

U

UNDERCUT—A term applied to a gate or valve for controlling the flow of loose bulk material from a hopper or bin, when it operates to cut off the flow by coming up through the material from below. With this arrangement there is somewhat less tendency for lumps to prevent complete closing of the valve. It is more often applied to quadrant than to sliding gates. (R. W.)

UNIVERSAL JOINT OR UNIVERSAL COUPLING—A form of coupling used to connect, for the purpose of power transmission, two shafts which intersect, but are not in line with each other. The most common form is known as Hooke's joint; it will theoretically allow a lack of alignment of as much as 90 deg., but on account of cramping and interference, the maximum practical angle is about 45 deg. The angular velocity ratio will be variable; that is, if one shaft rotates at a constant speed, the other one will have a periodically varying speed. If two of these joints be used with a short piece of shaft between them, and the coupling parts are properly arranged on the two ends with respect to each other, a constant angular velocity ratio may be obtained. The two shafts need not have their center lines intersecting in this case. As constructed, universal joints generally take the form of forked ends, pinned or keyed on each of the shafts, pointing toward each other, and pinned to points on the surface of a sphere, 90 deg. apart, or to the ends of a cross.

Universal joints are used to drive the swiveling trucks of locomotive cranes from a central longitudinal horizontal shaft, and allow them to take the angular position required by curves over which they operate. (R. W.)

V

VESSEL—Any description of water craft or other contrivance used, or capable of being used as a means of transportation in water or in air. (U. S. S. B.)

VESSELS OF THE UNITED STATES—Are vessels of any tonnage when (a) registered; (b) enrolled and/or licensed pursuant to law with such license in force if required. (U. S. S. B.)

VOUSSOIRS—Panel of the leaf of a dock gate formed by the intersection of **cesses** or horizontal stiffening members and vertical stiffening members. (R. S. M. Br. Cun.)

W

WARP—To tow or move a vessel by ropes; e. g., to warp her in to the pier. (Br.)

WASH—The wave action set up by a passing vessel. (R. S. M.)

WATCHMAN—Man employed to protect property on a wharf or in a warehouse from fire, theft and other damage. (R. S. M.)

WATCHING—A charge for the service of watchmen—a minor port charge against cargo. (R. S. M.)

- WHARF DEMURRAGE**—Although the term demurrage applies strictly to a penalty for the use of equipment beyond a specified contract time; such as for railway cars, or chartered vessels the term is applied to the penalty charge for the use of a wharf by merchandise beyond the specified time, usually 48 hours. This rule essential to maintain the proper functions of wharves as land-in places, not store houses. (R. S. M.)
- WHARF SHED**—A roofed structure or building on a wharf. (See Pier Shed.) (R. W.)
- WHARVES, LEGAL**—Wharves at which goods are required to be landed. (R. S. M.)
- WHARVES**—Sufferances—Are wharves may be landed and shipped by special sufferance granted by the crown. (Br. Cun.)
- WHEELED, FLANGED**—A wheel having one or more annular projections from the rim, generally outward. A single flange is usually at one side of the rim or tread, though center flanges are used in some types of chain wheels. Double flanges are usually at the two sides of the rim. (R. W.)
- WHELP**—One of the longitudinal ridges or projections sometimes formed on the barrel or drum of a capstan or on a gypsy head, to prevent slipping of rope on the drum. (R. W.)
- WHIPPING**—The turns of twine wrapped around a rope close to its end, to keep it from untwisting or unlaying. (R. W.)
- WHIPPING, OF SHAFTING**—Vibration or whirling of shafting when rotating at high speed, due to the axis of gravity and rotation not being coincident. (R. W.)
- WING**—The corner or side of the hold next to the "skin of the ship." (Br.)
- WIRE ROPE, FLAT**—A wire rope made for hoisting purposes, and consisting of a number of alternating right and left hand lay four-strand ropes placed side by side and sewed with soft iron wire so as to form a broad flat hand. (R. W.)
- WIRE ROPE, FLATTENED STRAND**—A wire rope composed of strands flattened on the outside so as to present a smoother surface and more wearing area. (R. W.)
- WIRE ROPE, GALVANIZED ROPE**—Rope in which the individual wires have been galvanized before being made into a rope. (R. W.)
- WIRE ROPE, HAULAGE**—Rope used for haulage purposes. It is composed of large wires in order to resist abrasion and therefore is only moderately flexible. (R. W.)
- WIRE, ROPE, HOISTING**—A flexible rope used for hoisting purposes as in cranes, mine hoists, elevators, etc., where it must carry heavy loads and pass frequently on and off a winding drum and around guide sheaves. (R. W.)
- WIRE ROPE, LAY OF**—The direction in which the strands are laid in the rope either right hand or left hand. In regular lay the strands are left hand lay and the rope right hand lay; regular left hand rope has the lay of both strands and rope reversed from the above. In Langs' lay the wires in the strand and the strands in the rope are made up with the lay in the same direction. (R. W.)
- WIRE ROPE, MARLINE CLAD**—Wire rope having its strand served or wrapped helically with hemp or fibre marline so that the metal is completely covered and protected from wear and the action of water, corrosive gases and liquids, etc., it is also easier to handle and can be coiled down like cordage rope. For some purposes both the strands and the rope are served with marline. (R. W.)

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WIRE ROPE, NON-SPINNING—A wire rope in which the strands are laid so that it will not rotate when a load is hung from the free end of a single line. (R. W.)

WIRE ROPE, TILLER, OR HAND—A rope made of six strands laid around a hemp core, each strand being a complete rope with six strands of seven wires each laid around a hemp core. The lay of the strands, rope strands and complete rope alternate in direction. This construction is also termed cable lay. (See Wire Rope, Marline Clad.) (R. W.)

WIRE ROPE, TRACTION—A wire rope used in aerial tramways for hauling the bucket along the track rope. The carriages are gripped to it automatically or by hand, or are fastened to it permanently, according to the system. (See Aerial Wire Rope Tramway, Double Rope System.) (R. W.)

WIRE ROPE, TRANSMISSION—Wire rope made into an endless loop and used for the transmission of power between a driving and one or more driven pulleys, intermediate portions being supported by idlers if the distance requires. (See Wire Rope, Haulage.) (R. W.)

WIRE ROPE CORE—The center of a wire rope strand or of a complete rope composed of a yarn or strand of hemp or steel. (R. W.)

WIRE ROPE STRAND—One of the component parts of a rope, consisting of a group of wires of uniform or varying size. The strand may be round or flattened. (R. W.)

WIRE TRACK CABLE—A round cable used for aerial rope tramways and cableways, consisting of a strand of seven or nineteen round wires surrounded by from one to five layers of abutting square or trapezoidal section wires, and with a smooth outer covering of special interlocking section wires, the various layers being alternately right and left lay. (R. W.)

WIRE TRAMWAY STRAND—A wire rope composed of a single strand made up of 1, 19, 37, 61 or 91 wires arranged in one, two, three, four or five layers around a central wire of the same size. Successive layers may be laid to the same or to alternating hands. Used as a track or trolley cable for aerial tramways. Also called round track cable and smooth coil cable. (R. W.)

WIRELESS FOG SIGNAL—The most advanced method is that of the revolving beam indicator having a wireless transmitter and wireless reflector, the whole apparatus revolving so as to enable a ship to fix her position by compass bearing when within a ten mile radius. The wave length is from $4\frac{1}{2}$ to 6 meters. The reflector makes a complete revolution once every two minutes and a distinctive signal is sent to indicate each and every half point of the compass. This should enable the bearing of the transmitting station to be determined within a quarter point of the compass, (Shank.)

WIRELESS METEOROLOGICAL SIGNALS—Under a new international meteorological code agreement is being sought to extend and unify the system of collecting meteorological data by wireless from ships at sea and to transmit weather bulletins and storm warnings from a sufficient number of stations to enable ships to be constantly supplied with reliable weather reports and forecasts. (Shank.)

WIRELESS NAVIGATION WARNINGS—Of wreck, derelict, ice berg, or an abridged notice to Mariners, relating to wreck or obstructions, alterations in buoyage or lights, drifting mines and all matters affecting safety of navigation. (Shank.)

WIRELESS TELEPHONY IN HARBOR APPROACHES—Communications by speech is of particular utility in the approaches to a harbor. A commercial service was initiated by the Mersey Docks and Harbor Board in 1921. Weather reports, distress and casualty informations from the main subject matter dealt with. Trinity House has adopted this system for communication between their light vessels.

WIRELESS TIME SIGNALS—The majority of wireless time signals are sent by an automatic mechanism operated by the pendulum of a chronometer situated in an observatory. (Shank.)

W/T. D. F.—Wireless Telegraph Direction Finding—Stations are established on shore equipped with apparatus enabling them to ascertain the direction from which wireless telegraphic signals transmitted by a ship station emanate. The base line between two shore stations being known the exact location of the vessel may be quickly calculated at the intersection of both bearings. (R. S. M.)

Y

YAW—In confined channels is the tendency in all ships tried is to make the ship sheer off the bank into deeper water. (Shank.)

YORK—Antwerp Rules—A set of agreed clauses in the Ocean B/L. adopted 1890, for the settlement of General Average.
Rule 1. No jettison of deck cargo shall be made good as general average.

Z

ZOLLVEREIN—The union of the various German States to enable them in their commercial dealings to act as one. Since the union of the Empire of Germany under one sovereign the Zollverein has ceased to be of importance. (J. Steph.)

THE ZOLLVEREINSNIEDERLAGE in Hamburg was a "Free Zone" maintained jointly by the states in the Zollverein. It was a fore-runner of the modern Free Port or Foreign Trade Zone. (R. S. M.)





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